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Indexes for the previous 6 months will be found in the First number of July and the First number of January.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[NOTICE.]

Wrinkle Department, American Gas Institute.

WRINKLE DEPARTMENT, AMERICAN GAS INSTITUTE,
OFFICE OF EDITOR, GAS OFFICE BUILDING,
DETROIT, MICH, March 12th, 1909.

To the Members, American Gas Institute: All members of the American Gas Institute are earnestly requested to forward contributions for the Wrinkle Department as soon as possible.

Your co-operation determines the success of the Department.

F. L. CROSS, Editor.

[NOTICE.]

Fourth Annual Meeting, Natural Gas Association of America.

NATURAL GAS ASSOCIATION OF AMERICA,
OFFICE OF SECRETARY,
DELAWARE, O., March 8th, 1909.

You are most cordially invited to attend the Fourth Annual Meeting of the Natural Gas Association of America, to be held in Columbus, O., May 18th, 19th and 20th, 1909.

The meetings will be held in Assembly Hall, Great Southern Hotel, the headquarters. The Great Southern is conducted on the American plan, and the following rates have been secured for the meeting—$2.50 to $5 per day. The most satisfactory quarters are always obtained by writing in advance to the hotel people, who will put forth every effort for the comfort of the Association.

The Governor of Ohio, Hon. Judson Harmon, will welcome the Association at the opening of the meeting.

A most interesting feature will be an exhibition of gas appliances.

The technical programme of the meeting is being compiled, and will be sent out later by the Secretary of the Association.

It may be that you are not a member of the Association, and, in soliciting you to become a member, we are not offering you a grand opportunity for disappointment, nor is there the least element of chance in the matter. You can submit your application at the meeting, but you will be showing the Association considerable courtesy and doing yourself a good turn should you sign and send in at once the inclosed application blank.

Columbus is a most attractive convention city, and the Committee on Local Arrangements will do all in their power to entertain all those who attend the meeting.

T. C. JONES, Secretary,
Committee on Local Arrangements.

[Special Editorial Correspondence.]

FIFTH ANNUAL MEETING, ILLINOIS GAS ASSOCIATION.

THE AUDITORIUM, CHICAGO, March 18, 1909.

Dear JOURNAL: The Illinois Gas Association surely "grows and grows," for President H. L. Rice, at the busiest time of the sessions to-day, was under "high pressure"—at least so some said—directin

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the work of 150 men actually engaged in carrying on the Association's good work. The morning opened with typical good behavior weather of the Chicago sort early in spring. It was clear and cool, and the plentiful reminders of sprightly sprigs of "The chosen leaf of bard and chief," which one saw almost everywhere, were other reminders that 'twas Patrick's Day, just the same as it was elsewhere than Chicago. President Rice himself called the meeting to order (he handled the gavel with as much vigor as was needful), introduced Mr. J. L. Cravath, Chairman of the Chicago Section of the Illuminating Engineering Society, who "welcomed us all" to the Mid-West Metropolis in fraternal speech. The welcome brought forth a graceful response on behalf of the Association by Col. E. G. Pratt, and then followed quite a volume of routine business, prominent in which weee the reports of the Executive Committee and those of the Secretary and Treasurer. The stack of telegrams and letters of regret from the senders over their inability to attend the meeting, and wishing the Association all possible success, would have dazed a less energetic man than Secretary Strohn. But he disposed of them as readily as though he were congratulating his Directors on the latest excellent showing made by the Company which he so ably serves. The recommendations as to changes in by-laws were adopted without debate, and the new members placed on the rolls came pretty near the two-score mark—decidedly good showing, it certainly is, if one were attempting to register the vitality of the Association. When the proper time came Vice-President C. H. Quackenbush assumed the Chair, and the President read his inaugural address, not the least satisfactory part thereof being the announcement how the gas industry of Illinois weathered the dark financial days of 1908. The paper list called for brought at the outset, Mr. Henry I. Lea, of Chicago, whose theme was "A New Method of Gas Manufacture." It is needless to say that the subject was well handled, as the discussion that ensued, while not altogether in consonance with the paper, was very brisk and instructive. The paper by Mr. E. H. Negley, of Canton, Ills., on the "Management of a Small Gas Company," brought the morning session to a close. The afternoon session was really on when that bundle of nerves and "go," "Uncle Jerry" B. Howard, of Galena, Ills., reeled off a series of "Reminiscences" that were listened to with interest and greeted with applause. Well could the beloved veteran "reminesse," for his connection with the industry dates back to the old days of the Brooklyn (N. Y.) Gas Light Company, years before the War of the Rebellion. In active harness to-day, as Col. Copley will amply vouch, "Uncle Jerry" is beyond a doubt the greatest human article in the gas industry alive. How his fellows behold him was loudly shown in the cheers that greeted him before, during and after the recitation of his story. The Association next heard an interesting presentation of the results of an "Investigation and Effect of Compression and Transmission on the Candle Power and Heat Units of Manufactured Gas." This matter was submitted in two parts. The first of these was submitted by Messrs. H. E. Bates and J. R. Rafferty, of Chicago., the second part being handed in by Mr. V. A. Houghton, of Aurora, Ills., and Hon. S. L. Cole, of Waukegan, Ills. The findings were exhaustive and thought-provoking, and go to show that gas men in Illinois are altogether satisfied that high pressure is a fact that is to remain with us; not only so, but that the development of to-day in it is but as the child is to the man. The closing number for the afternoon was an excellent paper on "Accidents: Their Cause, Prevention and the Settlement of Claims," by Mr. C. S. Goodwill, of Springfield, Ills. This paper contained many good thoughts, and especially in the knowledge that suits are being brought in goodly number now for the recovery of damages to those either killed or injured by the accidental inhalation of illuminating gas. The programme provided for no set entertainment the first night, each being marked as a host unto himself. It was noted, however, in the lobbies and several other lounging places about the Auditorium, that many "individual trys" on entertainment account were made. The resignation of Mr. William A. Baehr from the Chief Engineership of the Laclede Gas Company, of St. Louis, is bringing out many inquiries as to the reasons therefor, but the fact remains that no one seems to really know just now. The Laclede Company certainly in his resignation from the high place on its engineering staff, lost a man of more than ordinary caliber, and of unwonted activity. However, it is all agreed that Mr. Baehr's course was prompted by every good motive, and the surety was freely put out that his action was taken with due regard to his business future, the promise of which is as bright as the record that he has so manfully made since taking on service with the Company that he joined when the plant possessions of which were far from being as effective as those are to-day.—"W."

FRIDAY, March 19th, 1909.

Dear JOURNAL: The sporadicity of the entertainment for last evening seemed to have no bad effect upon the delegates here, for the last day's proceedings were commenced promptly on the hour set at prior adjournment. The first thing to occupy the Association was the report of the Nominating Committee, and the result of its reception was the election of the following office bearers for the ensuing year:

For President.—Emil G. Schmidt, Peoria.
For Vice-President.—H. S. Whipple, Rockford.
For Secretary and Treasurer.—C. B. Strohn, Elgin.
For Directors.—To serve 2 years—Erwin Rew and E. H. Negley.
" " 1 year—C. L. Day and George Goodnow.
Representative, American Gas Institute.—H. L. Rice.

An especial vote of thanks was tendered to Secretary Strohn for long, well sustained work in connection with the dual office held by him so worthily; and a like tribute to the retiring President was ordered placed on the minutes. The paper by Mr. R. B. Harper, of Chicago, on "The Comparative Value of Various Coatings and Coverings for the Prevention of Soil and Electrolytic Corrosion of Iron Pipe," followed, and it led to a brisk discussion that added much to the industry's fund of knowledge on these complex matters. The reading of the paper by Mr. Lucius S. Bigelow, of New York, on "Commercialism," which was also discussed at length, concluded the technical side of the convention. At 2:30 three well filled trolley cars, well filled despite the rain, started for the trip to Joliet, where, by the courtesy of the Illinois Steel Company, a thorough inspection of its mammoth coke oven plant was made. This is likely the most complete coke oven plant in America. The return to the city was made by 6:30, and an hour or so afterwards we were all comfortably seated in the main banquet hall of the Auditorium Annex, where, under the control of Toastmaster Eaton, a very enjoyable time was had. Over 200 shared in the feast, and although only 2 set speeches were listed on the programme—respectively, by Mr. R. C. Dawes, on "Commissions and Public Utilities;" and by Mr. J. C. Donnelly, of Chicago, on "Elimination"—it is nevertheless true that impromptu lists in the talking line, much time and thrilling music and "a vaudeville item" substitution, altogether yielded good entertainment of the Association. There will be nothing further done in connection with the Fifth Annual Meeting of the Association, than to say that its sessions this week in Chicago were of the order that goes to more solidly intrench the gas business in a field that grows larger every day.—W.

BRIEFLY TOLD.

A DISTINCT DISCLAIMER.—Under dating of the 10th inst., public distribution was made of a pamphlet, which bears the titling "The Shortcomings of the Public Service Commission Law of the State of New York." The pamphlet had the benefit and advantage of having been compiled and put out by Mr. Frederic Culver. In a note on page 3 of the pamphlet it is said that the compilation of certain statistics was "made by the Secretary of the Empire State Gas and Electric Association," from Reports of the Commissions. We have it on undoubted authority that the statistics referred to, which are mere summaries of the figures in the Commission's statistical report, were furnished in respense to a request from a member, without knowledge of the use which was to be made of them. Neither the Secretary (Mr. Chas. H. B. Chapin) nor the Association is in any way responsible for the publication of this pamphlet or for the opinions expressed therein. This denial, which is positive and final, is in every sense official.

CURRENT MENTION.—

MR. W. A. BAEHR resigned the position of Chief Engineer to the Laclede Gas Light Company, St. Louis, Mo., on the 8th inst., the resignation to become effective the 31st inst. His plans for the future are not fully matured. He preferred to resign and retain his self-respect, rather than continue and endanger it.

WE understand that Mr. Thomas B. Roddy has succeeded to the vacancy occasioned in Chattanooga, Tenn., by the resignation of Mr. Huntting, who has taken service with the Boston Consolidated Company.

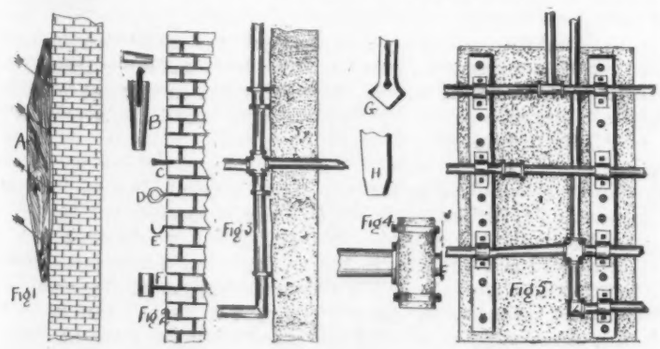
Preparing a Concrete, Brick or Stone Wall for Gas Pipes.

[Prepared for the JOURNAL, by "R."]

When we had strapping to do, in the olden times, on brick walls or stone walls, it was not a difficult matter to gouge out the mortar between the bricks so as to drive in wooden plugs for attaching purposes; but this concrete age gives many pretty tough surfaces for strapping, in order to get something to grip a pipe to or on. As gas pipes must be used on concrete walls as well as on walls of brick, so the gas man turns mason for the time being and works out the problem. I have seen various gasfitters tinker, hammer, cut, chip, bore, gouge and otherwise deface a wall trying to solve the problem of adjusting the desired strapping to which to plug the pipes, and oftentimes without avail. Anyone may dig out mortar in a brick wall and drive plugs; but even in the brick wall there is a system which can be used to advantage, and when it comes to the steel-like composition of the Portland cement concrete wall, it is quite essential that a system be employed in which are involved some very effective mechanical devices for properly drilling, driving, plugging and hanging. If this is not the case, the pipes will be damaged, the hangers sprung, the tools broken, the men excited and the concrete wall will stand solid as before.

To properly strap any kind of a wall requires practice, judgment and work. You can try the wall of brick with your straight-edge, as at *A*, Fig. 1, and you will be surprised to discover that the wall is not always true. There will be depressions, expansions, recesses, etc.

The wall may have been true at one time, but the frosts, dampness, weight, elements and other factors have been playing upon the wall until it has succumbed from the level point, at various points, as indicated by the arrows. So you cannot strap on a level, for there is



no level. You cannot drive plugs even with the bricks and secure the straps to these. Fig. 2 shows some of the plugs and hangers. You can get out the mortar between the bricks with the usual tool and drive in a plug *B*. or you can insert a wedge *C*, or a ring *D*, or a hook *E*, or a hanger *F*.

Let us begin with a wall having no bond strips, of the concrete character. The concrete wall, too, will be more or less uneven of surface, although it may have been supposed that the wall was exactly true when erected. First, get the tools. You need a chalk line, also a drilling tool with point, as in Fig. 4, at *G*. Also chisel, like at *H*. Likewise a hammer to use with a cold chisel as shown in this view. The wall shown in cross section is exhibited in Fig. 3. Strike your chalk lines up and down the wall to conform with the system of gas piping you may have to install. I witnessed the installation of a system of gas pipes for service in connection with producing gas arc effects on a concrete frontal of a building where colored lighted signs were used for advertising purposes. This called for a series of pipes as shown in Fig. 5.

In Fig. 3 is shown the plan of joining a pipe by using ring hooks inserted in the concrete wall. The hole is drilled in the wall, the point of the ring hook is inserted and the hole lead filled and calked.

For strapping, as in Fig. 5, after your chalk lines are set, use the plugging chisel of steel. Use a 10-inch tool, properly bevelled so as to cut well. With this you can help the drilling tool when the drilling tool strikes it too hard on the concrete and begins to revolve without cutting. In this case, the point of the tool will heat up, smoke will ensue and the temper will be lost from the steel unless you stop quickly. After the holes are made, you may use good hardwood, dry plugs. As many plugs are inserted green that work loose when dry, the precaution should be taken.

After the plugs are driven you can then strike the common level and saw them off even. The straight-edge can be used to good advantage in determining the levelness of the sawed plug heads. Next the straps can be nailed on and then the connections for the piping. Sometimes bond strips are used, but not often. Of course there are all-metal plugs and straps, and some prefer these. The metal plugs are tapped and provided with screw thread rings. These are quite handy to work.

[Continued from page 451.]

SECOND ANNUAL CONVENTION, INDIANA GAS ASSOCIATION.

HELD AT CLAYPOOL HOTEL, INDIANAPOLIS, IND., JAN. 20TH AND 21ST, 1909.

FIRST DAY—AFTERNOON SESSION.

The President appointed as a Committee to Select Next Place of Meeting, Messrs. Barnes, Dykeman and Atkinson, and announced the first thing on the programme was the reading of the paper on "High Pressure Boosting," by Mr. W. B. McDonald. As Mr. McDonald was unavoidably absent for a time, Mr. Dykeman was delegated to read the paper for him. The President further remarked that Mr. Dykeman had under his personal supervision the installation of this high pressure system about to be described.

Mr. Dykeman—Mr. President and Gentlemen of the Association: It is not often a subordinate is called upon to fill the shoes of the general manager, but such is my happy situation at this time, and if the result of the paper and the result of the questions asked about it indicate to you that I am acceptable in Mr. McDonald's place, then I shall be more than pleased.

HIGH PRESSURE BOOSTING.

During the summer of 1906, owing to a systematic and energetic canvass of the city, especialty the residential section, a large number of houses were piped for gas, and a great many gas stoves, arcs and water heaters were installed, which resulted in such a material increase in our output that the situation in Evansville, for a proper distribution of gas, had, by the middle of August, become acute.

With a pressure of 42-tenths at the station governor, only about 15-tenths was available at our 3 outlying districts, viz., the West End, South End, and Howell. Perhaps the greatest sufferer was the South End, inasmuch as a house-to-house canvass showed that there was a gas range, water heater, or other domestic gas appliance, beside the house illumination, in practically every household.

With this increased load, the season for laploads was rapidly drawing near, and to be ready for the demand that was inevitable and meet the situation and meet it quickly, was the problem that confronted me. Three plans for an increased distributing plant were considered.

1. To increase the number of the trunk mains from the works to the outlying districts; thus feeding into the distributing main a larger volume of gas with the holder pressure.
2. To erect gasholders in each affected district.
3. To break away from the old and established practices, and install a high pressure system.

Calculation and investigation showed that the last named plan was the only one that held out reasonable hopes of completion in time to meet the situation. The cost of installation would be much cheaper even for an outfit of much higher capacity than was required for immediate demand. It could also be arranged so as to form part of or nearly all of a belt around the area of supply to feed into other trunk mains as required later and boost into the low pressure mains.

As a large delivery could be obtained through a small pipe by this system, it was not so important to choose the shortest route if one more convenient, though somewhat longer, could be found—the extra expense being slight. On the other hand, there was the continuous expense of compression which, though small, was still appreciable, and also the fact that the controlling and delivering apparatus needed frequent inspection and attention.

The high pressure system was adopted, a very favorable route laid out, and work commenced September 1st. From that date until its practical completion, a period of 26 working days, the work was pushed with feverish haste and, not until the last regulator had been installed and the last record taken, was there any diminution in the call for speed.

The line (I use the term "line" so as to distinguish from low pressure mains) is 25,344 feet long, of 4-inch wrought iron pipe, the lengths averaging 22 feet, connected with style "20," Dresser couplings.

For changing the direction of the line, style "15" and "16" Dresser ells were used, except in several instances where 90° bends were made with the 4-inch pipe. Portable forges were used and the bends coupled with the style "20" Dresser couplings. Where the line crosses the traction roads, the Dresser insulating couplings, style "5," were used—two on each side of the track. Where the line parallels the traction roads, style "5" couplings were used instead of the style "20." These were used as insulators to prevent electrolysis, as the Water Works people in Evansville were experiencing any amount of trouble from electrolysis, and the time is surely coming when this matter will have to be threshed out and the responsibility placed where it belongs.

No screw joints were used, excepting where it was necessary when line valves were installed in order to facilitate the progress of the work. These valves, three in number, aided very materially in testing out the line.

Simultaneously with the starting of the work of laying the line, a 9½-inch by 14-inch Westinghouse compressor was installed at the gas works, and this compressor supplied the air pressure with which the line was tested, each day's work being subjected to 40 pounds pressure from 6 P.M. until 7 A.M. the following morning, and, not until the line showed a perfect test for those hours, was it back-filled.

Where the line intersected the low pressure mains, some 17 places, a No. 3 Reynolds service regulator was installed. The line was tapped for 1-inch service, a Century pattern combination service clamp and tee, a corporation cock, lead-tail piece and 1-inch service, ending in regulator box with service cock.

The low pressure main was tapped for 1¼-inch service "tee," a street ell and 1¼-inch service ending in regulator box with service cock. To these services the regulator was coupled with Union ells, the method of tapping the line and making connection being similar to that as recommended by Mr. F. Lester Price, Superintendent of North Shore Gas Company, Highland, Ills., an account of which recommendation can be found in the proceedings of the 28th Annual Meeting, Western Gas Association, held at Chicago, May 17th, 18th, 19th, 1905.

At one point where the line intersected the low pressure mains—one of the trunk mains feeding the West End – a No. 4 Reynolds regulator was installed. On each low pressure service from the regulators a connection for "U" gauge was left, which was used for adjusting the regulator to the requirements of its particular locality or district.

In most cases the vent pipe was carried to the level of the top of the regulator boxes, which were of cement and oak plank, with cast iron tops, designed to be large enough to allow room for workman to make necessary changes and repairs on regulators and fittings. In several instances it was found necessary to carry vent pipes above flood stage in order to insure proper operation of regulator at all times.

By October 1st the pressure had so materially increased on our outlying districts – *i. e.*, 15-tenths to 27-tenths—that my anxiety for the lap load was relieved, and thereafter the finishing touches to the work were prosecuted in a less feverish manner. As the stove and heater load drew nearer and nearer to the lighting load, and the reports from the complaining districts showed that the pressure was being maintained at 36-tenths, the point where the regulators were set to deliver, the relief and satisfaction apparent in the general manager's office were reflected through all departments, even to the office porter.

Bristol recording pressure gauges are maintained at 4 points on the low pressure mains—one in the South End, one in the West End, one at the office of the superintendent of distribution and one in the business district.

These charts reach me by 9 A.M. on the following morning; at the same time the compressor, steam and works' charts from the gas works are handed me, so that the previous day's record is at hand in order that any corrections or changes for the day may be intelligently considered. Simultaneously with the work of laying the line the installation of the compressors and attachments was carried out at the works with the same push and energy that characterized the work on the outside.

A Westinghouse, 9½-inch by 14-inch steam-driven compressor with capacity of ½ cubic foot per stroke, and a maximum speed of 140 strokes per minute, working against 10 pounds pressure, was installed. This compressor, with the one that was used for line testing, was connected by a 2-inch suction line leading to outlet of storage holder. Cut in on this line is a 12-inch by 96-inch steel tank.

The discharge side of the compressors is connected to a 4-inch line which discharges into a 66-inch by 190-inch steel tank conveniently situated. This tank takes up the pulsation of the compressors and insures a steady pressure on the lines—also collecting a great portion of the condensation. We have a Bristol recording gauge in the exhauster room near the compressor which gives a daily record of the pressure, and during the first year a steady pressure of 10 pounds was maintained on the compressor.

During the summer of 1907, the increase in business—much of which was secured on the high pressure line – sounded the alarm signal that the maximum capacity of delivery was again being reached and, to take advantage of this warning, one 8-inch by 14 inch by 8-inch steam-driven, double engine, water-jacketed, Clayton compressor, having a capacity of 2 cubic feet per revolution, approximately 25,000 cubic feet per hour, as the maximum working against 10 pounds pressure, was installed, the suction and discharge lines being arranged similarly to those of the Westinghouse compressors. With this equipment we have been enabled to meet all demands, and at the same time maintain a pressure on our low pressure mains with a variation of 12-tenths in the West End district—10-tenths in the South End district, 5-tenths in the business district, while the North End – where the other recording gauge is located, shows a variation of 7-tenths. All these variations occur at the peak load. At other times the pressure is uniform and maintained at holder pressure.

A test for cost of compression made 2 months after the Clayton compressor was installed gave a cost of .85 cent per 1,000 cubic feet. This cost per 1,000 cubic feet, is for coal only; maintenance and repairs were not considered, and the coal used was West Kentucky pea and slack, at 88 cents per ton laid down on boiler room floor and giving an efficiency of 6 pounds water evaporated to 1 pound of coal consumed. The repairs to the compressors have been trifling and such as could be done by our own employees.

I am not prepared to say that the quality of gas suffers in candle power by compression, inasmuch as we have not made tests on the high pressure gas for candle power. The gas compressed in Evansville is 18-candle power coal and water gas mixed at the proportion of ¼ water to ¾ coal gas.

Discussion.

The President—Mr. McDonald's paper is now before you for discussion. Mr. Perkins, have you had any experience with high pressure distribution? Are there any questions you would like to ask?

Mr. Perkins—I want to ask if anyone ever had a high pressure line stopped with naphthaline. We are furnishing gas at 15 pounds, and at the end of the line our pressure dropped to about 1 pound, finally going out or stopping altogether. Uncovering the main at several points we found that that stoppage was about a mile from the works. We put about 20 gallons of benzol into the main and in a short while the pressure ran up to about 60 pounds. The naphtha was softened so it poured out the drips. It never occurred since that time. It is the first case I ever heard of a high pressure line stopping up solid with naphtha.

The President—What was your delivery through that pipe?

Mr. Perkins—It averaged about 60,000 every 24 hours.

The President—We would be very pleased to hear from any other gentleman. Have you anything to say on the subject, Mr. Thwing?

Mr. Thwing—I, unfortunately, did not have the pleasure of hearing the paper. It is my belief that high pressure distribution is a modern method of distributing gas, particularly to small towns and cities. The time will come very shortly when towns which otherwise could not enjoy the privilege of having gas will enjoy it through the high pressure system. In our line of business we have received inquiries from towns with as low as 1,500 to 2,000 inhabitants, asking us as to the advisability of establishing gas plants. Of course, it is impossible to establish an isolated plant for towns of such sizes, but the advantages of gas, particularly as a fuel, to the community are very great, and I believe that high pressure distributing systems from some central point are going to solve the problem during the next few years.

The President—Are there any other questions?

Mr. Perkins—I would like to ask how it affected the candle power?

Mr. C. H. Graf—I did not quite understand from Mr. Dykeman how he overcame this troublesome proposition of pulsation. I would like to have him re-read that part of it.

Mr. John Dykeman—I will read from the paper as follows: "The discharge side of the compressor is connected to a 4-inch line which discharges into a 66-inch by 190-inch steel tank, conveniently situated.

This tank takes up the pulsation of the compressors and insures a steady pressure on the lines, also collecting a great portion of the condensation. We have a Bristol recording gauge in the exhauster room, near the compressor, which gives a daily record of the pressure, and during the first year a steady pressure of 10 pounds was maintained on the compressor." In the houses where we have a high pressure installation, and which are connected up by a No. 1 Reynolds regulator, there is absolutely no pulsation on the house lines at all.

Mr. Graf—I brought up that question, Mr. Chairman, because we have had some little experience in that way. We have a 12-inch suction line on the outlet of a 3,000,000-foot holder, having a 30-inch outlet pipe and running a compressor at the rate of 50,000 cubic feet an hour. We found that fully ½ mile from the works we had a pulsation of over 2 inches. We overcame that in practically the same way that Mr. Dykeman overcame his trouble, with the exception that we put in a sort of a baffle-plate. This consisted simply of a wooden partition, right in the center of the tank, through which we drilled 1-inch holes, and we experimented with the partition by blocking up the holes as we went along until we got to a point where we practically killed all the vibration. Nor did it impede the flow of the gas through the tank to any extent. We found also in making our connections—we provided for a connection at the inlet side of the holder so as to have a double connection—and when we used this inlet side we found the vibration on the station meter was so severe as to be rather alarming; but the putting in of this has obviated all that trouble. We have in Indianapolis quite an extensive high pressure system, a booster system, which was in about like condition 3 years ago to that narrated by Mr. Dykeman. In looking around as to the best way to meet the condition we were a little more fortunate than Mr. Dykeman. We found that we had quite a system of high pressure natural gas mains which, while not located ideally for our purpose, were sufficiently so to answer. We immediately started to work to strip all these mains of any connections and then tested them thoroughly under high pressure, and we have been operating them ever since. We started in with a 50,000-foot compressor. Next year we had to duplicate that plant, and within the 12 months we have had to put in a compressor of 200,000 cubic feet, and are now pumping gas through 8 to 10-inch mains at not to exceed a 12-pound pressure at the compressor.

Mr. Dykeman—I might say that, between our compressor and the tap at the main on the inlet, we put a 96-foot tank, so as to take up any vibrations on that end. We put this in on the line so as to take up any pulsations or any vibrations that might occur there. We have a small tank on one side of the compressor and a large tank on the other.

The President—Gentlemen, is there anything further you wish to ask or to say on this subject; if not, Mr. Dykeman, will you please answer the questions.

Mr. Dykeman—I will take, first, the question of naphtha. Any of you who know of the situation at Evansville in the past know that, during Mr. Wilkiemeyer's time, there was a naphthaline factory. It has always been a troublesome point. We had always been troubled with naphthaline; but on our high pressure line we had not one complaint of naphthaline from the high pressure side, although a great many of them were on the low pressure lines. These are attended to systematically, once a w eek. The first point where it was discovered was just outside the w orks' yard and from there on up about 1 square to 1½ squares, possibly 3 squares beyond that. By continual attendance to these drips we were not troubled with any naphthaline in the line at all. It was eliminated by simply blowing these drips and keeping in touch with the conditions. On the first line, where we had indications of naphthaline, the depth of the main was 3 feet 6 inches and, of course, it was tested out and not back filled until a 40-pound pressure was maintained on the pipes 12 hours.

The President—Did you lay your high pressure line on a grade or not?

Mr. Dykeman—Yes, sir. I maintained the same system laying the high pressure system that I maintained on the low pressure. Once or twice I found that condensation had gathered and a customer was shut off, the condensation following in on the service and not shutting off the line itself. We eliminated that trouble and for practically the last year there has been no trouble.

The President—It seems to me that the formation of naphthaline in a high pressure distributing system, as mentioned by Mr. Perkins, is somewhat unusual. If any gentlemen present can offer a different explanation I would be very much pleased to hear from him.

Mr. Dykeman—A question about the candle power was asked. As stated in the paper I was not prepared to controvert the opinion of some men that there is a relative difference in the candle power of high pressure gas, and sometimes I am led to believe that there is. Then the next day I go out all worked up only to find I do not believe there is after all. I am still in doubt. There must be some difference with the candle power, though.

A Member—To what kind of gas did Mr. Perkins refer in connection with this naphthaline deposit?

Mr. Perkins—Coal gas.

Mr. Wishard—Mr. President, I am somewhat familiar with the distribution of high pressure gas, inasmuch as the corporation that I represent has outlying between Wabash and Logansport, a distance of about 32 miles, a plant where gas is manufactured. We have an intermediate station between Wabash and Logansport. Wabash is 16 miles and Logansport is 15 miles from the station where we manufacture gas, and we manufacture strictly an oil gas or water gas, and we have had no trouble with naphthaline; neither have we had any trouble with condensation to any great extent. When building the line I put in drips at intervals of every ½ mile, built the line on a grade and have watched that very carefully and very zealously, because I was very much afraid of it at first. We have been running about 2 years, and I do not think we have taken from the line at any time to exceed a bucket of residue from any of the drips on the entire line. The thing I wanted to ask what was the effect of the Reynolds regulator which I understand you used. When you bring it above the ground does it change the temperature perceptibly?

Mr. Dykeman—None of them is above ihe ground.

Mr. Wishard—At Wabash our loss in candle power is probably from 1 to 2 candles. There is a difference between the works and the point of distribution of about 2-candle power; 1 to 2, or less; that is about the only change we can see.

Mr. Dykeman—Yours is water gas?

Mr. Wishard—Yes.

Mr. Moncrieff—I would like to ask if this high pressure line feeds the low pressure line, or if the consumers take directly off the high pressure line with the regulator between the consumer and the main.

Mr. Dykeman—We have what I have a good many times designated as a conglomerate system. We started with a belt line to feed practically only the low pressure system, but on the demand that came in for it from people on the high pressure line we were obliged to supply them with the high pressure gas. The installation, of course, is a No. 1 Johnson regulator, set by service to the meter. Now, when the high pressure crosses the low pressure system regulator, the No. 3 service regulator is set in; that is, the tap made on the high pressure line and the service made on the low pressure line and the regulator set in on these two services, the high pressure feeding into the regulator and the regulator feeding into the low pressure.

The President—Is there anything further, gentlemen, if not, I will declare the discussion on Mr. McDonald's paper closed. We are very much obliged to Mr. Dykeman.

Mr. J. N. Moncrieff, of Bloomington, Ind., then read his paper on

THE HANDLING OF COMPLAINTS.

Mr. Moncrieff prefaced his paper by remarking: Mr. President and Gentlemen of the Association, I would like to say that this paper deals principally with the smaller complaints, or complaints where the superintendent comes in direct contact with the consumer.

Complaints, *just* and *unjust*, are with us always; especially are they in evidence for the first 2 or 3 days after the monthly statements have been rendered.

Complaints at this time of the month are generally caused by high bills or incorrect reading of meters. As a rule these complaints are made in person at the office, with the request that we test the meter, for, as they say, they know something must be wrong.

After figuring the probable amount of gas used and this amount does not justify the bill, a man is dispatched to the house with instructions to re-read the meter and telephone the result to the office. If the meter has been misread, the bill is adjusted without further trouble. Should the previous reading be proved correct, the man returns to the office with the meter for proving. This perhaps will take 15 or 20 minutes. In the meantime the consumer is given a card with instructions how to read a meter; also, he is invited into the work shop, where explanations are given concerning the workings of a meter prover and how to prove a meter.

The consumer generally hesitates to accept this invitation, with the statement that the thing is too complicated for him, and that no amount of explanation could enlighten him in the important under-

taking of testing a gas meter. With a little persuasion, however, he is soon convinced that it is a very simple operation.

If, after proving, the meter is found to be fast, the consumer is rebated for the difference. If, on the other hand, the meter is found to be slow, it is set aside for repairs; if correct, it is returned to the consumer. If, for any reason a meter is tested, the result is telephoned or mailed to the consumer.

This may seem to involve a large amount of valuable time consumed in order to convince a patron that the gas company has a reliable method to determine whether or not a gas meter is correct. In the opinion of the writer, this is time well spent; also, a good opportunity is offered in which to convince the public that the gas business is a legitimate business, and that to deal honestly and squarely with the people is the intention of the company.

General Complaints.—All complaints are recorded and, as nearly as possible, are given attention in the order in which they are received. The complaint man is instructed to respectfully inquire into the trouble, and upon the completion of his investigation he informs the consumer. Should he be unable to locate the trouble, he promises to report it at the office, where it will be looked after at once by the foreman or superintendent.

All complaints, which have been attended to during the day, are gone over in detail with the superintendent; the cause of the complaint, the probability of its re-occurrence and how to avoid it. If, for any reason, the complaint man does not think the remedy applied will give permanent results, the matter is taken under consideration by the superintendent, who makes or suggests the necessary changes to avoid future trouble.

Gas Leaks.—Complaints of this nature are attended to at once. In case of a gas leak the consumer is asked the location of the leak, whether or not it is in the cellar or rooms. Also, if there is enough gas escaping to make it nauseating or disagreeable to remain in the house. If such is the case, the consumer is instructed to extinguish all lights, open doors and windows and remain in the open until a man arrives to repair leak. Upon receipt of this complaint a man is dispatched at once with instructions to turn off gas at meter if possible, and after locating and repairing leak to turn on gas, using the customary methods to detect any further leaks.

Stove Complaints.—This is a very important part of the gas business. Perhaps 40 per cent. of the total amount of gas sold is through the medium of the gas stove, and 50 per cent. of the total number of complaints received are due to the lack of care this appliance receives from the average housekeeper. The complaint man is instructed, after attending to the complaint, to go over in detail with the consumer the cause of the trouble and at the same time point out the many important parts in a gas stove, such as the proper flame regulations, the adjustment of the air shutter, the necessity of keeping the orifices free from dirt and grease, and the manner in which to remove the burners for cleaning. After giving these instructions, it is very seldom the gas company is called upon to make a second visit to remedy a complaint of this kind.

Complaints of Bad Service or Lack of Pressure.—It is generally the case with most gas companies that in one or more districts the pressure does not hold up during the heavy pull of the day. This is a source of great annoyance to the consumer who is unable to obtain a sufficient supply of gas at meal times, when it is most needed. This is caused by small mains or a more than ordinary rapid growth of the neighborhood. The consumer is informed in regard to the true condition of this locality and advised that it is the intention of the company to make the necessary alterations as soon as possible in order to better the service. If this condition is caused by small mains it can be benefited by a regular going over and flushing with gasoline, so as to get the maximum capacity at all times. One patron on this line is requested to inform the gas company whenever the pressure falls lower than usual. Upon receiving this information the mains are gone over as stated.

The fact that the management acknowledges that the service is not what it should be, and that it is the intention of the company to remedy the trouble in the near future, satisfies the patrons for the time being and puts them in a better mood to endure the condition until it can be improved.

It is a stated fact that the money of a gas company is made or lost in the retort house, or on the generator floor. It is also a fact that the business of a gas company is made or lost by the manner in which complaints are handled by them.

The foregoing methods of handling complaints are not theories, but are in actual practice in a small city of about 10,000 population, where the patrons occupy all stations in life, ranging from the scientific college professor to the uneducated day laborer.

Hence a complaint man should not only be a mechanic, but a diplomat as well, for he deals with the consumer at a time when he (the consumer) is in an unnatural state of mind, owing to his just or unjust grievance, and at such time one thoughtless word from the complaint man will make a life-long enemy for the company.

The reverse is also true. Where a timely alleviation of trouble and a disposition on the part of the company to cheerfully and patiently handle same, will make staunch friends and advocates, whose value to a gas company cannot be estimated.

Discussion.

The President—Gentlemen, you have heard the reading of a most interesting paper. The business of a gas company is almost vitally dependent, as stated by the author, on the handling of complaints. It is a department in which public sentiment is created for or against us, more probably than in any other department of the business. It is, therefore, very necessary in conducting the business of a gas company to attend to complaints of our consumers promptly and courteously, and to give them every attention until the cause of the trouble is remedied or removed. It is a subject that must appeal to all of us, and I trust you will take part in a discussion giving us the benefit of any suggestions or recommendations you may have to make upon the paper as now before you. We will be pleased to hear from Mr. Riley.

Mr. Riley—Mr. Chairman and Gentlemen: Not being a member of the Association, it never entered my mind that I should be called upon, consequently I am not prepared to say anything on the subject. However, one point I will try to make. In the complaint department of the Indianapolis Gas Company we have a meter on our counter, which meter is so arranged that we can show the entire mechanism, going to make up the working parts of the meter, to a consumer as he comes in there. Our plant is so far away from our office that it is not possible for us to take the consumer out to the plant and show him a regular test on the meter. This meter is so arranged that we can show the diaphragms in working order as well as the arms working on hinges on the top, and you can show the arm as it works on the dial. After a thorough explanation to a consumer when he makes a complaint about his bill which he thinks is too large, and says his family have been away from home for a certain period, and he hasn't used any gas and that no gas can have passed through his meter, we always make it a point to show him the working parts of that meter, and I say that is a valuable thing for a gas company to be able to do. We also have a testing meter, and when we get a very serious complaint that we think it worth that kind of consideration, we send out testing meter and the chief inspector installs it alongside the regular meter. On that meter a record is made of the conditions in the house for a period of time, working on the same system as the Bristol recording gauge. The sheet is taken from that recording meter, brought back to the gas office and handed to the manager of the complaint department. When the consumer comes in again we not only show him that he has used gas, but the amount of gas he has used there during the different periods of the 24 hours. I think that is about all I have to tell you at the present time. [Applause.]

The Secretary—One point I wish to mention (and I think it is well worth considering) is where Mr. Moncrieff speaks of the number of complaints received in regard to the gas stoves. Mr. Moncrieff claims that fully 50 per cent. of complaints are due to the lack of care these appliances receive from the average housekeeper. I was going to suggest that prevention in this matter is very much better than cure. But we cannot always have what we call the demonstrator or instructor to go to the homes and follow up the sale of a gas range and explain the uses and intentions of the broilers and ovens and various parts of the stove. In the smaller districts where that demonstrator cannot be afforded I think it would be good policy to employ some man connected with the company to visit the home directly after the delivery of the stove to give to the new consumer, or novice as it were, some instruction which will prevent the common complaints which we all know are received from those who do not understand the gas range at all. We all know that if a manufacturer of a sewing machine sells a sewing machine, one of the first things of importance that he will attend to is to give instruction in the use of that machine to its fullest capacity, for these two reasons: So that the purchaser will understand it; second, so that she or he will be an indirect advertisement in the neighborhood for the sale of further

machines. For these two reasons it is very important that we should try to give some instruction, and if not by a direct demonstrator, which, of course, is the best means, at least by some official qualified to handle that subject, and thus prevent those complaints which we are trying to cure.

Mr. Dykeman—I have what I term my stove repairer, and immediately after the installation of a stove it is his duty to visit that house to see that the stove is in efficient working order and that the installation is properly made. Quite a cook himself, he gives instructions as to the operation and handling of the stove, and if necessary cooks a batch of biscuits. In several cases where the complaints had to do with the oven he made up batches of biscuits and baked them, sometimes even furnishing the materials. I would like to ask Mr. Moncrieff where does the moral obligation of the gas company in these matters stop and where does it begin. For instance, we have much house piping that becomes choked up and rusts. Whose business is it to clean it? I would like an expression of opinion about it from the gentlemen of Indiana. We ourselves do a great deal of that kind of work and a large expense is put up against my department for maintaining these complaints for old house piping. We have to send to the houses to see what is the trouble, and a good many times something is removed, and if we undertake to send the consumer a bill for the price of the pipe, a great outcry is made by him. Often a complaint comes in for poor gas, but investigation shows there is no trouble at all, the candle power is good, and the pressure fine, and the meter working satisfactorily with a good flow of gas. We do find a lot of cheap installment, 10-cent mantles, and no mantle burning properly. They say, "Your gas is no good," and we admit it isn't any good for that purpose. Sometimes we put on a "Welsbach" mantle just to show them what a good mantle will do. In this particular instance we eliminate the trouble in that way—that one mantle will bring an order to the office to come and take care of others. We also have in my department what some people call a gas "tinker." I saw that term in the AMERICAN GAS LIGHT JOURNAL. I have two of them, and it is their absolute business to go around and tinker with the lights. When we get a complaint of poor gas it is their business to tinker with the lights. They carry their stock of mantles, lamps, etc., with them in a wagon, and the complaints are kept down in that way. I would like so far as I am concerned to have this matter of the house piping threshed out a little bit. I am rather at sea over it.

Mr. Moncrieff—As to the matter of the house piping, I think it depends on how far the gas company is responsible for that piping; in other words, if they put the job in they are responsible for it and should keep it in order. Many companies do not go beyond the meter; we do not. If we get a complaint of that kind we look the job over and tell the consumer what is needed, recommending him to a good plumber.

The President—Anything further on this subject?

Mr. Barnes—I disagree with Mr. Moncreiff as to how far we should go with cleaning out house piping. I think it is the duty of every gas company to give the consumers good gas. It doesn't take long to clean out the piping; that is, unless it has to be renewed. It can be blown out in 1 to 1½ hours and would cost very little. We are aiming to suit the consumers. If the consumer gets a plumber, he won't care anything about fixing up the house piping; he doesn't care whether the consumer gets gas or not. Further, a plumber will charge a man $2 or $3 for cleaning out house piping. The plumber will not look after the burners or lights. So I think the gas company should clean out the house piping and at the same time look over the burners and lights to make sure that the man is satisfied. Seventy-five per cent. of the complaints in our city are due to poor lights, largely the lights from inferior burners. Consumers call the price they pay for them a good price; but if we could educate them to buy a better burner and have the gas company look after their lights, instead of the consumer looking after them, it would eliminate a lot of trouble. We have a solicitor or representative whose business is to examine any poor lights or poor fixtures. He is not a gasfitter or a tinker, as my friend from Evansville says. He is a salesman, a man who can sell stuff. A gasfitter fixes things, but he doesn't know anything about selling, unless you in some instance happen to have a first-class, good man. Our man was taken out of the shop and he knows how to sell. He will fix the lights, and if they are of poor material he will sell the consumer some ones made of better material, and will put on a good light to show the difference in some cases. Then he will demonstrate that if the consumer can have one good light he can have all good lights. The point I put up to a man, if he says his gas is poor or his stove supply insufficient, is this: "If your neighbor has a good light, you can have one under the same conditions." The thing to do is to educate the people to buy a better class of goods, whether a Welsbach mantle or some other; but not to buy 10-cent mantles. I would not give a man a 10 cent mantle. I tell him we don't sell 10-cent mantles; if he wants that kind he will have to go some place else; we do not sell anything we cannot recommend, and we cannot recommend them.

Mr. Sommers—I am inclined to take issue with Mr. Barnes about the house piping. In small towns it may be all right, but in large ones you couldn't cover the territory. I think house piping should not be tackled by the gas company. As to the matter of testing the meters. When you find the meter too fast, what do you do? Do you reduce the bill? I should think that would travel both ways. In Chicago, where the people demand tests of the meters, the agreement is that if the meter is fast the company pays for the test. The consumer ought to be made to pay if the meter runs slow.

Mr. Barnes—I understand that the coming Legislature intends to pass a public utilities bill, and in that they will have a way of testing meters. If a customer wants his meter tested, any gas company in the cities or State of Indiana will be compelled to test it. The consumer pays if the meter is slow, and the gas company pays if the meter runs fast, as I understand our newly proposed bill.

Mr. Dykeman—Who pays if the meter is correct?

Mr. Barnes—The consumer.

Mr. Hayden—We make a point with our chronic kickers of talking them into taking our prepayment meters, so when our statements are delivered, the 10th of the month comes and they pay their bills; we very seldom hear a complaint, whereas two or three years ago we had them all the time. We follow that practice of doing all the free work we can on house piping in order to overcome bad feeling, and in our little town there is about as good feeling towards the gas company as you will find anywhere else, both from the daily newspaper and from the people.

Mr. Rowland—The subject of handling complaints is largely a matter of judgment. To Mr. Dykeman's inquiry as to house piping, and how far we should go in that, I think it is entirely a matter of judgment. My experience has been that one can well afford to look after any slight troubles, even going so far as to take some piping down that had been in houses for years, with the accumulations that have occurred in the elbows. I have taken those out, replaced them and put them in good shape free of charge. As to new complaints of poor gas and deficient lights in general, one can almost tell from his knowledge of his patronage what the nature of the complaint is going to be before he reaches the scene of action. As a rule we send our solicitor to answer a great many of these complaints instead of the repair man. We find that the house needs a change of tips, possibly inferior lamps have been used or a low grade of supplies put on by the consumer, who did not understand putting them on, and in order to make a comparison to show the difference, our solicitor puts on one of our own lamps to demonstrate to him that it is not the fault of the gas but purely the burner; this often aids us in making some sales. When our solicitor is making his regular rounds he picks out as many of those cases as he can and attends to them. As to meter complaints, we urge customers to visit our shops to have the reading of the meter explained to them, and we have a man to make explanations even up to telling how the meter works; but you might say there is not 1 consumer in 50 who will avail himself of that invitation. We found some years ago that, when a man complained several times of one trouble, there was probably this reason for it: In small companies the manager will probably tell his repair or general utility man to visit certain places on his rounds to look after certain troubles, and if a fellow becomes possibly confused or forgets some of the orders the thing is not looked after. The best way to check that is to use a duplicator, leaving a copy of the order in the office, giving to the man who is going to look after the job the original; then when the work is done a report is made. In that way you know that each complaint is looked after and that none is overlooked. When a man makes repeated requests for the testing of his meter we will not visit his property three or four times. If we are satisfied the meter is correct we shift him to a prepayment proposition. If there is any doubt as to where the gas went, either the consumer or the company will put a recording test meter right up against the regular meter in his premises. With these devices we have our complaints reduced to a minimum and satisfactorily taken care of.

Mr. O. O. Thwing—One of the speakers mentioned a test or complaint meter. I believe that is one of the most desirable instruments

a gas company can have. The meter can be placed on the service of a kicking or objecting consumer and it will keep an absolute record of the use of gas during the day and night. I was connected with the Milwaukee Gas Light Company when Mr. S. J. Glass tried out such a meter, and one of the first places we tried it on was at the residence of a newspaper man who had been a consistent and constant kicker about his gas bills for months. We placed this meter in his residence without his knowledge, and at the end of a week he was called to the office. When he came to make his usual complaint about his bill a practical history of his daily or nightly light was told him. He was connected with a morning paper. He was out at night, but his family was not. He didn't know how late his family stayed up. Getting home early in the morning, and feeling the need of a cup of coffee and a bite to eat, he would start up the gas stove and probably let it run about 2 or 3 hours, and imagine he had it in use about 15 minutes. On two occasions we discovered that the family had had a late lunch about 11 or 12 o'clock at night and left the gas stove burning all night. The complaint meter, I think, is one of the most valuable things that a gas company can have. Every company should have one or more of them according to their ability to maintain one or many. The gas company is in a peculiar position. According to all law and equity the accused is on the defensive and the proof of his or her guilt rests with the prosecution. The gas company is supposed to be guilty until it proves itself not guilty. [Laughter.] The electric light company, when it is the subject of complaint of any kind, either in regard to the quality of its light or the quality of the current it is furnishing, simply says "prove it," and it has to be proven. A street railway company, when accused of having a bad schedule or not following the schedule or not furnishing good service, does not attempt to prove that it is furnishing proper service. It rests with the public to prove that it is not. The gas company, on the other hand, accepts the accusation of being guilty, then goes to its consumers, taking exceedingly great pains to prove it is right. Therefore, I believe gas companies should use all means at their command to prove they are right since they have established that precedent.

The President—Mr. Moncrieff, on behalf of the Association, I extend to you its thanks. We will now hear the paper of Mr. A. G. Pickens, of South Bend, Ind., on

DISTRIBUTION METHODS.

All the subjects relative to the distribution of gas, and of practical interest to the gas engineer, have been so thoroughly and ably presented to the various gas associations in recent years, that when asked to write a paper on some distribution subject, I was at a loss to make a selection. I could think of nothing in my experience sufficiently interesting, to warrant a paper before the Indiana Gas Association that had not been very ably covered at other gatherings of the fraternity.

I, therefore, decided to take one distribution system that I am familiar with, and follow its methods of operation from the outlet of the works' governor to the consumer's burner. This system is not mythical, but is in practical everyday operation and, by the results obtained, I believe it is to be essentially effective.

As a preface to the analysis of this concrete example of distribution, I will describe, briefly, the city that is using it. The city proper has about 55,000 inhabitants and is supplied entirely with low pressure. Two suburbs are also given service from the central plant. One suburb, of about 1,000 inhabitants, 2 miles from the plant, is supplied with holder pressure and house governors, the other, of about 10,000 inhabitants, 4 miles distant, gets low pressure service through a district governor. The city is practically level, and nearly all parts are easily accessible from the distribution shop. All the distribution work in both suburbs is handled by men from the shop in the city, with the exception of one fitter who is stationed at the office in the larger suburb to attend to leaks, complaints and fires. The soil in most localities, in all three districts, is sand and gravel which digs easily. The city is well paved, so that the expense for teaming is rather light. Although the system I shall describe was worked out to get results in one special locality, I believe that any city of between 20,000 and 100,000 people could use it to advantage. I believe it flexible enough so that the old excuse of "Local conditions" need never be offered against it.

For convenience in studying the features of this system I will divide my paper into five parts, namely:

(A) Street department; (B) shop and order department; (C) storeroom; (D) meter shop; (E) records.

(*A*) *Street Department.*—Under this heading I will first describe the method of laying mains.

Some time in advance of the main laying season a preliminary estimate is made up for each street it is proposed to supply. This estimate sheet gives all the data available at the time, relative to soil, length of pipe to be laid and cost, and shows whether sufficient pipe and material are on hand to complete the work. The report also shows the number of houses on the run and an estimate as to consumption. With this information at hand it is very easy to ascertain whether an extension on any street is liable to give a good profit on the investment. These preliminary estimates are filed whether the streets are run or not. If not, they form a record for reference if any particular street is under consideration at a future time, and if run they give a check as to accuracy in the estimate as against the actual cost of consumption.

The estimate for a street showing good business having been approved by the management, the street is given a job number and all labor and material used are charged to this number. In this way all charges for main work for a season are separated according to job numbers, and the estimated cost may be checked as a guide for future work in the same locality.

The organization of gangs for main laying is all under the supervision of a general foreman. This man is mounted on a motor-cycle and visits each gang at least twice a day. His duties are to see that each gang is doing its work properly, to keep a supply of materials ahead for the work in hand and to exercise a general supervision over the men. This man also makes sketches, wherever necessary, of pipe runs. A sketch is always required for intersections, drips, valves, specials and main ends. These points in the line are measured from such landmarks as fire hydrants, street manholes and curbs, and the sketches are transferred later by this same man to the maps and permanent office records.

Under the general foreman, and in charge of the actual main laying are main foremen. Each of these has a gang of 10 men called pipemen and an assistant foreman with a gang of 10 diggers. The pipe laying gang of 10 men is organized as follows: Three men are caulkers, 4 place the pipe (2 in the ditch and 2 on the bank), 1 mixes cement, 1 trims up ditches and digs bell holes, and 1 cleans out the pipe ahead of the layers. If pipe larger than 8-inch is being laid the 2 men on the bank will need help in placing the pipe. The assistant foreman with his gang of 10 diggers precedes the pipemen on a street and opens the ditch to the proper depth as instructed by the main foreman. A cover of 3 feet 6 inches is allowed for mains wherever possible; the grade being taken from the curb on all paved streets and estimated by the fall of the surface on all graded but unpaved streets. On streets not graded information is obtained from the city engineer as to the proposed grade and laid out by the general foreman. The alignment is understood between the city engineer and the Company to be as follows: On all streets running north and south, lay 5 feet from the east curb line; on all streets running east and west lay 5 feet from the north curb line.

As soon as the digging gang has street "B" opened to proper depth and length, and the connection to the old main located, it either goes to another street and repeats the process or else returns to street "A" where the foreman and pipemen are working and begins back filling. In this way the more expensive pipemen can be kept laying pipe all the time in ditches opened by cheaper labor.

The foreman and his gang of 10 men, after finishing street "A," go to street "B" and begin the main laying. As soon as the men who clean out pipe and dig bell holes have a start made the pipemen begin putting pipe in the ditch. Four and 6-inch sizes are handled without tools, 8-inch is handled with hand spikes and all sizes above 8-inch with a pipe derrick. The man at the spigot end of the length wraps the yarn around the pipe, and the man at the bell end shoves the length home with a bar. The man at the spigot end places a 24-inch spirit level on each length unless the grade is sharp. After about 6 lengths are in and sent home one caulker starts yarning up the joints, and after about 12 lengths are in the foreman lines up the 12 lengths and the 2 remaining caulkers begin making joints. All mains except bridge lines are standard cast iron and no mains are laid smaller than 4-inch. Joints are made of high grade, Portland cement on all sizes from 4 to 16-inch inclusive. All sizes above 16-inch are made up with lead. As soon as the joint is made, if a hot sun is shining in the ditch, a paper or any other suitable covering is placed over the joint to prevent surface cracking. The cement is mixed neat, and has just sufficient water so that, when mixed and squeezed, it will just retain the impression of the fingers. Only a small

quantity is mixed at a time and the pans used are knocked free of all set cement from previous mixings. Moistened, but untarred, jute yarn is used. The joint is made as follows: First a roll of yarn is hammered in, then cement is caulked in solid, to within an inch of the face of the joint, then a driving yarn is used, and finally a light facing of cement finishes the joint.

As soon as all pipe is cleaned out in advance of pipemen the cleaner comes back to point of starting and begins to block up each length by tamping dirt on each side about 2 feet back from the bell and 12 or 18 inches deep. This steadies the pipe while being caulked.

After all the pipe for the day is laid, and allowed to stand for about an hour, a test of 5 pounds air pressure is put on the line and the joints tested with suds. If the line is tight it is blown off at this pressure to clean it, and the gas connection made at the point of beginning. The pipemen not needed on this connection begin filling in and tamping around the pipe. Twelve inches above the pipe is tamped solid, the remainder being filled in later by the digging gang. When the gas connection is made and the line purged, the main foreman and pipemen go to the next street opened by the assistant foreman, who comes back to "B," fills the ditch and cleans up the street.

Rather than increase the size of the gangs it has been found more economical to increase the number of gangs with no change in the organization from that above described. Following this method the total labor charges for trenching, pipe laying and back filling on 4 and 6-inch mains, is from 7 to 9 cents per foot. The average total costs, for labor, pipe and sundries on all mains laid during one season, were:

4-inch mains	.....	$0.39	per foot.
6 "	.....	0.70	"
8 "	.....	0.88	"
10 "	.....	1.00	"

Pipe at this time was worth about $27 per ton, and laborers were paid 17½ cents per hour, pipe men 20 cents, foremen 25 cents and the general foreman $85 per month. The above figures include several streets which were either paved or connected in paved streets. These cost figures are watched carefully and, at the end of each month, a report is made up covering all mains laid, size, length, etc., and the total cost and the cost per foot of each job.

The organization for service work is also under the supervision of the general foreman, who visits each gang twice a day, if possible, gets materials on the jobs and lays out the work in the order it is to be done. Wherever possible the work is bunched in localities, so that moves between jobs are short. Each gang consists of 6 men, a working foreman, a helper and 4 laborers. Each foreman is given a number of orders at a time, so there will be no delay by waiting for work. The tool carts used are light, two-wheeled ones, making it unnecessary to have a team for moving from job to job. Each gang moves its own cart and carries fittings and pipe enough for 4 or 5 services at all times. This supply is replenished from time to time by the company's delivery wagon, under orders to the storeroom from the general foreman. Each gang foreman is furnished with a schedule showing the size pipe to be run for each class of building in the city, and also a tapping schedule showing the size of tappings required for each size of service taken from mains of the various diameters in use. No service is run smaller than 1 inch, and none larger than 2 inches, without special orders from the engineer. Very few 1-inch services are run, as most houses supplied require 1¼-inch service.

The standard service consists of a swing-joint at the main, made with a street tee and a street ell and straight pipe to the cellar, ending with a cap. The work of extending the service for the meter connection is done by the shop force. No curb stops are used except in special cases. No special service coating is used, except where electrolysis is feared; then a lagging of cement mortar is placed on the pipe. When the gang has a service run and tested with gas on, the foreman measures all pipe used, counts fittings and sketches on the reverse side of his service return the location of the service relative to the building it supplies. This service return is a 6 by 4 card, showing location, material used, labor and cost. These original cards are never copied, but are collected from the gangs by the general foreman and filed as part of the permanent street record. On repair service work a similar return is made up with a change in color, so that repairs and new services may be easily distinguished in the file.

The cost of labor on services averaging 60 to 70 feet, is from 6 to 7½ cents per foot. This figure is an average one, with all pavement jobs included. The foreman of a service gang gets 25 cents per hour, the helper 20 cents and laborers 17½ cents. Each day the general foreman submits a report of work done to the engineer. This report covers mains and services laid and orders on hand, and shows any leaks repaired and where found. The report is made to show, not only the day's work but also the work done from the 1st of January to date.

A timekeeper, mounted on a bicycle and reporting to the general foreman, visits each gang twice a day, makes up pay vouchers, and does errands for the various foremen.

The street drips are pumped by a man driving one horse attached to a 250-gallon tank-wagon. The tank is equipped with a hand force pump and a flexible metallic hose which is attached to the drip pipe. The drippage is measured by counting the strokes of the pump, which has been calibrated per stroke. The man keeps a record of the quarts pumped from each drip on a printed form which shows the principal drips in the system divided into two sections for convenience in visiting. These drips are pumped at least once a week. All other drips in the city are termed "Yearly Drips," and are only visited once a year.

(B.) *Shop and Order Department.*—The organization of the shop force is as follows: A foreman has charge of all work, and is assisted by an inspector and a clerk, who dispatches orders when the foreman is out. Under the foreman are the fitters and helpers, complaint men, meter wagon drivers and lamp trimmers. This foreman also has charge of the meter shop and the teaming and care of the Company's horses. The foreman, inspector and complaint men are furnished with motor cycles, or bicycles. The foreman inspects as much of the fitters' work as possible, but depends on the inspector to see every job that requires piping. Small work, such as stove repairing and fixture hanging, receives no regular inspection, although the foreman sees much of this work. The despatching clerk stays at the shop all day and keeps the men working on small orders supplied with work as they report to the shop from time to time.

The work of the shop is handled by 6 order blanks made up to show the classification of the work to be done. This system easily separates the charges into the various accounts as recommended in the American Gas Association's "Uniform System of Accounts." The order blanks used are:

(a) House fitting expense order.
(b) Appliance order.
(c) Meter order.
(d) Miscellaneous order.
(e) Turn-on and turn-off order.
(f) Change of name order.

These order cards are in two parts and, when made up by the order clerk in the office, are separated into original and duplicate, the original going to the shop, the duplicate being retained by the clerk until the work is completed, when the order is returned to him, and he then destroys the duplicate, filing the completed order under street and number in the main office. The house fitting card is used to order the hanging of fixtures, piping of houses, sale and installation of lamps and the extension of risers. The appliance card is used for the sale and installation of ranges, hot plates, water heaters and any gas appliances handled by the Company. The meter card is used when a meter is set, removed or changed. The miscellaneous card covers all the small work, such as adjustments and repairs on stoves and lamps, connect or disconnect appliances, complaints and leaks. Leak orders are marked by a rubber stamp across their face "LEAK" and are given the right-of-way over all other complaint work and in fact over all work. The turn-on-and-turn-off order is use when a consumer orders the removal of his meter, but when the meter is a dipping meter recently installed, and it is not desired to remove it, and is also used to turn on this same meter for a new consumer. The change of name card is used when one consumer moves into a house as soon as vacated by another and requests that the meter be transferred to him. No explanation is necessary as to the method of handling the miscellaneous, change of name and turn-on-turn-off orders, but I will explain in detail how the others are handled.

All meter orders are taken care of by a specially constructed wagon, built to hold 25 five-light meters, which is drawn by one horse and operated by one man. Each afternoon the foreman gives the meter tester the number of meters, with size, that will be needed the following day, and the tester has these meters ready when the wagon calls for them in the morning. The meter wagon man loads the meters into the wagon, straps them into place, and having previously arranged his order cards in the order they are to be done, is ready for

his day's work. The outfit does not return to the shop or stable at noon, but both horse and man eat on the street and return to the shop at 5 P.M., to get orders for the next day and unload removed meters. The wagon is equipped with a vise, nipples of various lengths and a few short pieces of pipe. It also carries a box of fittings and tools. In this way the meter man can do any fitting work necessary to set the meter if he finds the meter will not go in properly. It has been found entirely unnecessary to have two men on the meter wagon as one man averages about as many orders per day as two. This man and wagon handle from 20 to 25 orders per day regularly. As many wagons are put on as are required to care for current work.

The house fitting and appliances orders, where piping is required, are handled as follows: When the order is received the inspector visits the premises to estimate the amount of pipe, number of fittings, etc., that will be needed. He then gives the storekeeper a requisition for the material needed and the storekeeper gives one of the teams the required pipe and a locked box containing a standard assortment of fittings and nipples. The driver with a number of such boxes and a load of pipe distributes them in the cellars of the various houses according to a list given him by the inspector. When the driver reports to the foreman that the deliveries are made the orders for the work are given to the fitter, who takes his tools to the first job and there finds the pipe and box of fittings. Each fitter has a key to these boxes. As soon as this job is completed, tested and inspected, the fitter measures the pipe used and lists it with all other materials on the back of his order card. The time taken to do the work is also shown. On the face of the order he states what work has been done, gives the date and signs his name. After relocking the fitting box he goes to his next job, where the same process is repeated. The inspector picks up the fitter's completed orders and gives him new ones, so that each fitter has several orders ahead at all times. There is no necessity for these fitters reporting to the shop at all, except on pay day, as all their material is sent to them on the jobs and all their wants and questions are looked after by the inspector on his daily visits.

The boxes and surplus pipe are later collected by the team and returned to the storeroom, where the pipe is checked up, a return slip made up for that used, and fittings to correspond to those used replaced in the box and the box locked. No attempt is made to check up shortages in fittings, except brass goods, as it seems a waste of money to use 25 cents' worth of time to find a 5 cent shortage. Two dozen of these boxes are in operation, so that it will not be necessary for a wagon to pick them up one at a time to keep the work going. Each box is numbered and the driver keeps a record of each box he delivers and picks up, so that the movement of a box can be checked at any time.

The men who handle complaint and leak orders report to the shop each morning, and start with as many orders as are on hand, and at about 10 A.M. telephone to the shop for other orders from the locality they are working in. Again, at 1 P.M., they report to the shop, and at 3 P.M. telephone for instructions or rush work that must be done before night. Wherever possible all orders except leaks and complaints are held at least a day, so that the foreman can bunch his work and thus cut down the expense of long moves.

Each fitter and complaint man carries a supply of postal cards which he leaves at all places that he is unable to enter. This postal card is addressed to the gas company, and on the correspondence side, after the fitter has filled in the blanks, reads something like this: "Our man called to attend to Order No. 26,607 at 4 P.M., Jan. 1, 1909, and was unable to obtain admittance. Will you kindly state below when it will be convenient for him to call again, and post this card." The consumer fills in blanks which show the day and time he prefers to have a call made and mails the card. This method of handling "not at home" calls is very effective, as, in many cases, it saves another useless call.

The work of maintaining gas arcs is handled by 5 trimmers, one of whom is made head trimmer. This man looks after the work of the other four and makes all repairs on lamps. The 4 trimmers simply clean lamps and install mantles and report any necessary repairs to the head trimmer, who can repair lamps more economically than to let each trimmer repair his own. The trimmers carry loose leaf books with a sheet for each lamp to be visited, showing location, date of visits, etc. Each trimmer visits from 50 to 80 lamps per day, and the head trimmer from 30 to 40.

The payroll is made up by the foreman, from slips made up daily by the men. These slips are so arranged that, besides stating the nature of the work, they also classify that work according to the uniform system of accounts.

The despatching clerk keeps an account of all orders received and done by the shop. This record is separated into the six classes of orders and shows when each order was received, when completed, by whom, and by whom inspected. A daily report showing the number of orders done by each man is made by the clerk from the completed orders returned to him. This report is extremely useful as a check on the amount of work a man is turning out as compared with another man doing the same class of work. It is considered much more effective than one which simply shows the average number of orders done per man per day, as slow workers will speed up to keep pace with the faster ones. In addition to the daily report which shows no costs, a monthly summary is made up showing the cost of each order done in the various classes of accounts.

The labor cost *per foot* on house piping and appliance work should run about 3 cents, the cost per order for gas appliance work from 90 cents to $1, and the cost per order for house fitting work from 70 to 80 cents.

Set and remove meter orders cost about 17 cents each for labor, gratuitous work about 5 cents, and complaint expense from 20 to 35 cents according to the season.

The total cost for both material and labor on maintaining arc lamps runs from 18 to 20 cents per lamp per month. These charges are based on the "Uniform System of Accounts" method of bookkeeping.

The shop foreman gets $100 per month, the inspector 27½ cents per hour, and the clerk 15 cents per hour. All fitters and complaint men get 25 cents per hour, and helpers 17½ cents. The lamp trimmers get 17½ cents per hour, and the head trimmer 20 cents.

(C) Storeroom.—The storeroom is operated by two men, a stockkeeper and an assistant. The stockkeeper makes up all reports and inventories, checks all requisitions and return slips and keeps the stock cards written up to date. The assistant waits on fitters and keeps the stock and room in order.

Fitters are not allowed to draw material from the storeroom without first making up a requisition for the material needed on a special form. A blue slip is used for pipe, fittings, etc., and a yellow one for miscellaneous goods. These slips show what the material is to be used for, the order number, consumer's name and address, and must be signed by the fitter. When a fitter completes a job he makes up a storeroom return slip, which shows what he has used. The stockkeeper compares this return slip with the requisition for the same job and can easily check up the material that the fitter returns, if any is returned.

As ranges are delivered to the person ordering them some time in advance of the fitter's appearance to make the connection, a stove order card is filled in by the storekeeper when he delivers the stove to the driver and the driver states on the card where he delivered the stove and returns the card to the storeroom. These cards are filed by the storekeeper and form a record for the foreman to consult before sending out orders to fitters. The storekeeper has standard lists of fittings for both gas appliance and house fitting orders, and keeps the fitting boxes filled with these assortments.

The stock card provides a storeroom record that shows the quantity of material on hand at the end of every month. This card shows when each invoice of material was received and the unit cost of the same, and it also shows the issues by months with the proper classification charge. In order to simplify the work of writing up these cards at the end of the month, a storeroom issue summary is used, which shows on one sheet all the material chargeable to an account. This summary may be written up every day or every week, and at the end of the month the columns for each fitting or item are totalled and transferred to the cards.

(D.) Meter Shop.—At the present time the meter shop has two men, a tester and a helper. It is thought possible to do away with this helper as a permanent man when the meter shop can be operated in the same building as the fitting shop. At rush times the tester could be given a man to help paint and handle meters, and much of the time now taken in dispatching meters could be used in testing, while the shop dispatching clerk was sending out the meters. With the meter shop some distance from the fitting shop much time is lost by the meter wagon having to go to the meter shop to load up. The foreman of fitters has general supervision over the meter shop men and directs each day what meters he will need for the following day.

The driver of the meter wagon brings to the meter shop at night the meters removed during the day. These meters are tested and put in their proper clasification, either as "Ready for Service," "To be Oiled" or "To be Repaired." The work done on meters consists of testing, adjusting, painting and oiling. No repairs except broken

index glasses and re-packing stuffing boxes are made at the local shop, as it has been found that this work can be done very much cheaper at the large meter companies' repair shops; therefore, all meters needing repairs are sent to these shops. This reduces considerably the labor charge in the meter shop as it is not necessary to employ high-class meter repairers when only testing, adjusting, oiling and painting are done. Any man who can use a soldering iron, and who has a bit of mechanical ability, can be easily instructed in this work. All meters are tested with a check cap, no open tests being made.

Blue prints are provided the tester showing, the method of handling a meter from the time it enters the shop until it is ready for service. These tables show the tests to be made in the proper order.

For the past year all meters coming to the shop from service and new meters sent from the shop contain oil, as recommended in a paper recently read by Mr. W. A. Castor, of Philadelphia.

These meters are then known as "Class No. 2: Dipping Meters," "Class No. 1" being those meters containing no oil, "Class No. 3" being those whose diaphragm clearance is $\frac{3}{16}$ inch or less. "Class No. 3" meters contain less oil for each diaphragm than "Class No. 2." The oil used in these meters is a very light oil with the following composition: Five parts, light machine oil; five parts, sperm oil; one part, rapeseed oil. This oiling costs, for 5-light meters, about 5½ cents per meter, which figure was arrived at in the following way: Thirty-six meters (5-light) were selected from a regular day's work and oiled; the labor at 30 cents per hour, on these meters, amounted 85 cents; the oil ($7\frac{3}{16}$ gallons at 15 cents per gallon) was $1.08; the rivets (9½ ounces at 5½ cents per pound) were 3 cents; the solder (½ pound at 22 cents) was 11 cents, making a total of $2.07. This divided by 36 gives the figure 5¾ cents per meter.

This figure, it is believed, is somewhat higher than would be made if more meters, say a full day's work for a tester, were included in the test, as it will be readily seen that a man oiling meters all day would attain greater proficiency and handle the meters much quicker than in a short test taken from an ordinary day's work. This fact is borne out by an experience in which it was found that on a certain day no meters oiled and ready for service were on hand, and as it was necessary to set a great number of meters in the next few days the meter men were instructed to spend the entire day in oiling. There were on hand at the time 270 5-light meters, ready for oiling. These 270 meters were oiled in 9 hours by 2 men, which meant 30 meters per hour, and shows what can be done, if necessary.

Each meter test card made up by the tester after the meter is run through shows, on the reverse side, whether the meter has been oiled or not, and also whether the meter is in Class No. 2 or Class No. 3. This class is also shown by using round-head rivets, on Class No. 2 meters, and flat-head rivets on Class No. 3 meters. The oil is placed in the meter through a ¼-inch hole punched in the outlet side of each diaphragm compartment, the rivets being sweated in this hole.

A daily report from the meter shop is made out by the tester, which shows all work done on meters, separated into the various sizes and the various classes of work done. This report also shows what meters are on hand at the end of each day and also in what condition they are. A column is provided for each of the following headings: On hand for testing; on hand for oiling; on hand for repairs; on hand for service.

The foreman of fitters gets this report from the meter tester each day, and, by examining the "On hand for service" column, sees at once how many meters he may depend on for setting during the day.

The labor cost of testing, adjusting, oiling, painting and repairing is also shown on this report, and these figures run about as follows: For small meters—3, 5 and 10-light—testing costs about 4 cents per meter; adjusting costs from 5 to 5½ cents; oiling costs about 2½ cents per meter; painting costs about 1 cent per meter. So few repairs are made on meters that the cost of repairing per meter is very low, scarcely any time being charged against it. These costs should be reduced somewhat if the meter shop is run in direct connection with the fitting shop and under the supervision of the shop foreman. The present meter tester gets 30 cents per hour and the helper 12½ cents.

(*E*) *Records.*—I will now call your attention to the various report forms used in the above described distribution system. These blanks are before you, and I will here close the formal reading of this paper and describe briefly the use made of each form shown.

Discussion.

The President—Gentlemen, the paper by Mr. Pickens shows exhaustive preparation and labor upon the subject in which his Company has evidently (and he as well) given much thought in the attainment of perfect methods of distribution. It is almost impossible for one to intelligently discuss this paper. It is rather a text for us to take home and study carefully over in order to cull out the good points and appropriate them to our own use. The paper, however, is open for your discussion. We would be pleased to have as much interest taken in discussing this paper as has been evidenced in the preparation of it.

Mr. S. C. Rowland—In the system adopted by Mr. Pickens and his Company, what plan have they adopted for installing the meters; that is, in hanging them to house pipes and services.

Mr. MacNabb—I would like to know what grade of mantle Mr. Pickens' Company uses on arc lamps.

Mr. Pickens—On the Welsbach arc lamp we use a special arc mantle.

Mr. MacNabb—Do your fitters do other work than cleaning lamps?

Mr. Pickens—No, we have special lamp cleaners—a gang of 5 men.

Mr. MacNabb—And all the time it is charged to lamp cleaning?

Mr. Pickens—Unless they get their work done before the end of the week. Of course, then, we have to find something else for them to do. The regular man does from 50 to 80 a day. One of our men cleans from 75 to 80 in a day in the business part of the town. The men in the outlying districts do from 40 to 50. Once in a while a man will only visit 30 lamps in a day.

Mr. MacNabb—What distance will your men have to travel to clean the lamps?

Mr. Pickens—I can't tell you that. They are scattered all over the city.

Mr. MacNabb—In cleaning a lamp do they give it a thorough cleaning, and also clean the globe?

Mr. Pickens—If it is necessary. They turn it on and see that it is in perfect working order.

Mr. O. O. Thwing—I understood Mr. Pickens to say that they use cement joints in pipes up to 12 inches, and from 16 inches on lead joints. I would like to ask why that division is made between the two different classes of joints. Also, he states that they use a covering of cement to prevent electrolysis on the services. I would like to know if that is a preventive; and, if so, to what extent?

Mr. Dykeman—I would like to say a word or two on the matter of arc lamp trimming. I have about the same problem in this respect that the author of the paper seems to have had. We have one general inspector whose business it is to see that the other 4 men do their work, and the number of lamps averaged per day is about 60. They are told to clean the lamps thoroughly, as also the globes and shades. We found it necessary to install in rooms with low ceilings a style of reflector which did not originally come with the lamp. I adapted a ceiling shade by using some discarded electric reflectors by having my meter man make the cap inside so as to fit—*i. e.*, to make the socket so it would go over a 6-inch pipe. I am very much more in favor of it than I am with the regular line of ceiling reflectors. We use the Welsbach arc, No. 2 mantles, and find them much more satisfactory than any of the others we have tried. I used the Humphrey mantle, but did not find it satisfactory. It did not stand the racket, the shaking of the buildings in our business district. The mantles gave way. We use the center support and they must be cleaned every time the lamp is gone over.

Mr. Barnes—I would like to ask the gentleman how often is it deemed necessary to clean these arc lamps, per month or per week?

Mr. Dykeman—We deem it obligatory to go once a week. If we do not we hear from them. We make that a moral obligation. We agree with the customers that the lamps will be trimmed once a week. Our town is what is known as a Saturday night town and it is up to the trimmer to see that these lamps are in good shape for Saturday night.

Mr. MacNabb—I think the lamps should be cleaned every week. If they are cleaned thoroughly they might go 10 days, but they really ought to be cleaned every week.

Mr. Moncrieff—I would like to ask if from 7 to 9 cents a foot for digging and filling means for all kinds of streets, including clay streets. You spoke about the meter wagon coming in at 5 o'clock. Don't you ever set any meters after 5 o'clock in the evening?

The President—Is there anything further, gentleman; if not, Mr. Pickens will close the discussion.

Mr. Pickens—The figures I have in my paper, $2.13 per foot for 12-inch mains, is not right. It is too high. It was put in there by a mistake which was due to the fact that we had to run a special line; that was the only 12-inch line we ran that season. It crossed three

tracks of the railroad company, and in fussing around there we lost a good deal of time. It is hardly a fair figure as the others run. There are so many of these questions that I am afraid I can't recollect them all. Some one asked about hanging meters. The meters we install are set up with a solid connection, street ells and solid wrought iron pipes. Unless there is a cellar in the house with a shelf built in it—a good many of the cellars in South Bend are simply holes in the ground for the furnaces—we put in one of the Spangenberg, cast iron, adjustable shelves. These can be set up in the wall at any angle; they are adjustable that way and also horizontally. If you get a bad place in the wall you can adjust the shelf so that it makes the meter perfectly level. While we use cement joints on all lines above 16 inches, we find considerable trouble with caulkers who are making up joints all the year on small mains getting a tight job on large mains. We cut out a good many joints. Of course, you know, I made some cement joints on a 24-inch line at one time and had 3 or 4 joints on 500 feet cut out. It took about 2 hours to cut out each joint. We found it cheaper to use lead. Another reason we use lead is because on those joints, as I stated, we make up our joints very dry. We screen the cement after we have it made it up. It is dry and crumbling in the pan. A man going around a 16-inch pipe will find about half the joint is set up before he gets it done. As to the electrolysis and cement lagging I mentioned. Only in the last 2 or 3 years we have had trouble with electrolysis. In 2 or 3 streets in South Bend, where the tracks are poorly bonded, we have pulled out a good many services. I am not satisfied that that lagging of cement will prove exactly what we want, although it looks as if it might be satisfactory. We have used it very little. We have had no electrolysis on the services we have used it on, but we may have in 4 or 5 years. The question asked in regard to how often our lamps are cleaned, I will answer by saying every one of our lamps is cleaned once a week, or oftener, if the consumer makes a complaint. As to whether the 7 and 9-cent labor charge included all streets. It does. That was an average charge for the whole year and included all the pavement jobs we did. As to setting meters after 5 P.M. Our meter wagons report at 5 o'clock and, unless there is special work, they do not go out again. Of course, if it is absolutely necessary to set a meter after 5 o'clock, we either send a wagon or a complaint man with a meter. We try to give the people good satisfaction, and if they absolutely must have a meter between 5 and 6 o'clock or later, we try to give it to them.

The President—You mentioned that the soil of South Bend was sandy. Do you account in that way for the low price of from 7 to 9 cents, as well as the good management of the company?

Mr. Pickens—Of course, that soil is of sand and gravel. It digs very well, but caves easily, and we have to do a good deal of bracing. I might say these costs have been considerably reduced from what they were digging in the same soil, due partly to this organization. The same might be said of our shop and order department. By organizing this thing, and watching the daily reports that come from those men, we have reduced in 7 months our total distribution charges over 2 cents per 1,000 feet of gas sold; so that in 7 months we have cut off 2 cents from our distribution charges in the shop alone; that does not include anything on the street at all.

The President—Mr. Pickens, I am sure the Association is much in debted to you and is under many obligations to you for the very valuable paper you have prepared. It shows a conception of organization and execution and detail that we can all be benefited by. The Association extends to you its thanks. [Applause.]

(To be Continued.)

A New Gasholder Tank now in Process of Construction, Bradford Road Gas Works, Manchester, England.

[Prepared by J. G. NEWBIGGING, M.Inst.C.E., for the Manchester Institution of Gas Engineers.]

The new tank which is in course of construction at the Bradford Road station is 285 feet internal diameter and 46 feet 6 inches deep to the bottom of the footings, and is to receive a 4-lift gasholder of a total capacity of 10,410,000 cubic feet, which will form the nucleus of a new section of the works to be erected on the adjoining land.

The Site.—The site of the structure is at the northeasterly extremity of the Bradford Road works, on land at an altitude of about 8 feet above the general level of the rest of the works.

Before finally deciding on this site, 5 boreholes, 4½ inches in diameter, and ranging from 50 feet to 80 feet deep, were sunk, in order to ascertain the nature of the underlying strata—one in the center of the tank and the remainder round the circumference, at equidistant points, in the middle of the wall trench. The boreholes proved the substratum to be mainly boulder clay at their upper sections, finishing with grey shale at their lower sections, with thin bands of marl and black shale intermedia lly.

The contract for the construction of the tank was accordingly let, and work commenced on the 11th of November, 1907. Land covering an area of 37,428 square yards (including the area occupied by the tank) was placed at the disposal of the contractor during the execution of the work, and was inclosed within a sleeper fence, so as to separate it from the rest of the works.

The site was first leveled to an average depth of 6 feet, the quantity of material removed for this purpose being 29,960 cubic yards. The circular trench was then excavated to receive the wall. It measured 301 feet in external diameter by 16 feet 6 inches wide and 50 feet deep, except at the point where are the inlet and outlet pipes, which was excavated to a depth of 56 feet 9 inches for a length of 41 feet 6 inches. In the positions occupied by the main piers, the trench was recessed back 3 feet 6 inches for a width of 11 feet 3 inches. The outer wall of the excavations at the bottom, with the recesses for the piers, was undercut 2 feet back to allow for putting in the foundations.

The Excavation.—In order to support the sides of the trench while the building of the tank was in progress a very complete system of timbering was adopted. The struts, walings and punchings were mainly of pitch pine, measuring 9 inches square, the poling boards of Baltic white timber, 8 inches by 1½ inches, and close timbered. The first ring of timber was 8 feet deep and the remainder 4 feet deep—there being 10 rings altogether in the depth.

The struts were fixed 5 to each bay, those at the counterforts being 18 feet long and the intermediate struts 14 feet 6 inches long. The total number of struts was 1,600. The walings at the counterforts were 11 feet 3 inches long, and intermedially 18 feet 6 inches—there being 64 of each in the circle, or a total of 1,280. The punchings were cut to a suitable length to fit in betw een the walings.

The total quantity of timber used in the trench was as follows: Polling boards, 89,500 sup. feet by 1½ inches thick; waling timbers, 14,660 cubic feet; struts, 18,330 cubic feet, and pu nchings, 3,000 cubic feet. The quantity of material removed in excavat ing the trench was 31,391 cubic yards.

The strata revealed by the excavation fully confirmed the earlier investigations made with the boreholes. The whole of the ground was solid and showed no signs of subsidence or damage from coal workings. The fact that underneath the site of the Bradford Road works is undermined, and it being known that shallow seams of coal had been worked in the vicinity of the tank, about the end of the Eighteenth Century, rendered it necessary that more definite information should be obtained with regard to the po sition of these before the building of the tank wall was commenced.

In order to ascertain if any of the shallow seams of coal had been worked sufficiently near to the base of the tank to be likely to cause damage to the structure, headings were driven from several points in the bottom of the tank excavation in a lateral direction for a distance of 30 to 40 feet. On examining the strata revealed by these headings, no indication was found that there was any danger to be apprehended to the tank from the working of the shallow seams of coal; so the headings were filled up with concrete tightly rammed, and the construction of the tank was at once commenced.

In order to deal with the water in the excavation, 4 sump-holes, each 6 feet square, 3 of them 56 feet deep, and one 63 feet deep, sunk at equal distances apart, had been provided in the specification, together with a system of 9-inch drain pipes running round the bottom of the inner and outer sides of the trench, and connected by cross drains to the sumps. The quantity of water met with during the work of excavating the trench was small and was mainly surface water; so the forming of these sumps and system of draining was not proceeded with.

The clay puddle used for the tank was selected from the excavated material and stored on the site to weather, and carefully tempered by being passed through pug-mills before use. The quantity of puddle used in the contract was 7,940 cubic yards.

The clay puddle under the foundations is 12 inches thick, and was well trodden in, punned with flat punners, and levelled to a uniform thickness. The whole of the bottom of the trench was covered with puddle before the contractor was allowed to com mence the laying of the concrete foundations.

The concrete in the foundations is 2 feet 6 inches thick, composed of one part of cement, one part of sand and four parts of agglomerate, consisting of bricks, clean hard stone and old fireclay retorts, broken to such a size as would pass through a 1½-inch ring – the proportion of clean hard stone being not less than one-third.

The Tank.—The footings consist of eight courses of bricks commencing with 11 bricks thick and diminishing by half-a-brick each superior course. The tank wall is built in Old English bond, and is 7 bricks thick above the footings for a height of 16 feet 6 inches. From thence it is reduced by half-a-brick at every 4 feet in height; finishing with 3½ bricks thick for a height of 3 feet 6 inches at the top —making the total height of the wall 44 feet.

The main piers, 32 in number, are 11½ bricks deep and 8 bricks wide throughout, with eight courses of footings commencing with 15½ bricks deep and 12 bricks wide. The secondary piers, 32 in number, are carried straight from the first set-off in the wall, and are 7 bricks deep and 5½ bricks wide.

The whole of the brickwork is laid in cement mortar compose of three of sand to one of cement by measure – carefully measured in boxes, thoroughly mixed together dry on a platform, and then placed in mortar mills, slaked and further mixed to a proper consistency. The puddle behind the walls and piers is 2 feet thick.

No dry well has been provided for the outer legs of the inlet and outlet pipes, nor has the wall been recessed back for their reception. The circle of the tank is unbroken, and two circular tunnels, each 5 feet 9 inches diameter, formed with four 4½-inch brick rings, are built in the wall, through which the inlet and outlet pipes pass to the outside. The space round the pipes in the tunnels and outside is carefully filled in solid with puddle.

Plates of ¾-inch steel plate, 6 feet 9 inches long by 4 feet wide, are built into the wall at a depth of 12 feet below the top of the base stones, with six 3-inch steel bolts 13 feet 3 inches long, for anchoring the standards of the gasholder.

The stone used throughout the work is Fletcher Bank. The guide stones, five in the center line of each main and secondary pier (or 320 stones in all) are 2 feet 3 inches wide by 1 foot 9 inches deep. They are built into the wall with a 3-inch projection. Before the guide rails are fixed, the faces of the guide stones are dressed off, leaving a projection of 2½ inches. Four 1-inch rag bolts, 9 inches long, are let into each stone to which the guides are fixed.

The rest stones, 64 in number, are 7 feet 6 inches long by 3 feet 6 inches wide by 1 foot 6 inches thick, and are bedded in cement with their inner ends against the face of the wall. The main pier stones are 9 feet long by 6 feet 3 inches wide by 2 feet thick, with rounded arrises.

The top of the tank wall is surrounded by coping stones, 2 feet 9 inches wide by 6 inches thick, cut to the curve of the wall, with radiated joints. At the intermediate piers, the coping stones are 5 feet 6 inches deep by 4 feet 4 inches wide by 6 inches thick. Above the coping will be placed a curb of stones, 18 inches high by 12 inches thick with semi-circular top, held together with slate dowels run in cement. The quantity of stone used is 10,225 cubic feet.

The dumpling will be formed at an angle of 40°, after the tank wall is completed—built in three steps, and covered with puddle 18 inches thick, and concrete 18 inches thick. Underneath the stanchions carrying the tank framework, will be formed 180 concrete blocks.

The trammel is of steel built up in the form of a fish back lattice girder, triangular in section; the total length from the center of the column to the end of the trammel being 142 feet 6 inches. At a distance of 13 feet 3 inches from the end is fixed a carriage, with rollers travelling on a circular rail, 258 feet 6 inches in diameter, the rail being spiked down to a bed of sleepers for the whole circumference of the rail.

Brick Making.—The clay from the trench has been stored on the ground, to be used as required for brick making and puddle. The brick making plant has been erected by Messrs. H. Harrison & Sons, who are sub-contractors for the manufacture of bricks to Messrs. E. Nuttall & Co., the contractors for the construction of the tank. It consists of a grinding pan in which the clay is tipped from self-tipping wagons, the larger stones having been previously extracted by hand. After thorough grinding in this pan the clay is passed through two sets of grinding rollers, set in tiers, by which means any stone is thoroughly crushed to powder. The clay then passes into a pug-mill, where it is thoroughly mixed, and then forced through the die on to a cutting table. The plant is capable of making 30,000 bricks per day. The bricks are taken from the table, packed on to trolleys and then sent through the drying shed into the kiln.

The kiln itself is the most novel portion of the plant, being of the Hoffman or continuous burning type, in place of the usual chambers. The kiln is entirely open, there being only the end walls and the piers, in which latter are placed the side flues and dampers. The main flues run parallel to the kilns, one on each side, joining together at the top, and then passing to the drying sheds. When filling the kiln with bricks, air is prevented from passing in (except in its legitimate way) by plastering up the green bricks with brown paper. The green bricks are covered on the top with a course of red brick and then with 3 inches of dust; but provision is left for feeding the chambers as required, both with air and with coal or breeze. No chimney is used for this plant, the gases being drawn through the kiln by means of fans and then discharged into the drying shed. Thus the heat generated is entirely used up before being passed into the atmosphere and great economy of fuel is thereby obtained. The bricks made by this process are extremely hard, well shaped and of good color – being much superior to the usual common brick of the district. Over 3,000,000 will be used in the construction of the tank wall, and there will be required about 1,100 tons of Portland cement and about 2,250 tons of sand for setting them in.

Cost of the Tank.—The contract amount for the construction of the tank is $170,275, including the cost of clearing the ground on which the tank is constructed, or (say) $17.65 per 1,000 cubic feet of gasholder capacity. Against this must be placed the saving in the cost of levelling the remainder of the ground within the sleeper fence—an arrangement having been made with the contractors for the tank to level this ground free of cost and manufacture bricks from the clay recovered. A royalty is also paid per 1,000 bricks made, it being estimated that there is clay available for the manufacture of 20 million bricks.

The brickwork of the tank completed, and the stipulated period for the completion of the whole of the contract is June 30 next.

After the formation of the dumpling the tank will be tested with water—its capacity being about 9 million gallons. Messrs. Ashmore Benson, Pease & Co., the contractors for the tank-framing, and gasholder and framing, will then commence their contract, which is due for completion by December next year.

Temperature Distribution in Gas Engines.

At the last meeting of the British Institution of Civil Engineers Professor Bertram Hopkinson read a paper on "Heat Flow and Temperature Distribution in the Gas Engine." He noted:

In the course of the expansion and exhaust strokes of the gas engine, from a quarter to a half of the whole heat developed in the explosion is discharged into the cylinder walls. This flow of heat, though its effect on efficiency is relatively small, is very important in the practical working of the motor, because it necessitates the provision of special appliances for its removal from the outside of the engine as fast as it is generated within; and it also requires the existence of a temperature gradient sufficient to carry it from the place where it is generated to that at which it is removed. Consequently, high temperatures must exist in the uncooled parts of the engine and great temperature differences between one part and another. These conditions give rise to dangers from preignition and also to mechanical stresses in the metal, which, between them, account for not a small part of the practical difficulties encountered in running large gas engines.

Given the rate of heat flow into every portion of the cylinder per square foot, it would be possible, by a sufficiently elaborate mathematical analysis, to calculate the distribution of temperature throughout the metal. Apart from the difficulty of the problem, however, the data for its solution are only imperfectly known, and a rough calculation of the general mean temperature distribution is all that is possible. Such a calculation was made in the paper, and it led to the conclusion that the temperature on the inner surface of portions of the engine which are efficiently water cooled can never rise above quite a moderate value. But the temperature at the center of an uncooled piston, 12 inches in diameter, may reach 400° C., or even more.

In his paper, the author described experiments made upon a Crossley gas engine of 40 B.H.P., with the object of determining the actual temperature distribution and its relation to the conditions of working. In the first group of tests, the temperatures were compared with the total loss of heat as measured by the rise of temperature of the jacket

water. According to theory, the excess of the temperature at any point over the mean temperature of this water should be proportional to the total heat loss, except in so far as the distribution of this loss over the metal surface exposed to the hot gas is altered. By changing the strength of mixture, keeping other conditions the same, the heat loss was varied between limits of about 1,300 and 2,200 B.T.U. per minute—the engine firing practically every time, and it was found that the piston temperature was very closely proportional to the loss of heat. Under normal working conditions at full load, the temperature at the center of the piston was found to be about 370° C. above that of the jacket water; in the exhaust valve, 400° C.; and in the inlet valve, 250° C.

The next group of experiments related to the effect of varying the conditions of running upon the temperature of the metal. The dependence of heat flow and temperature upon the strength of the mixture, the time of ignition, and the degree of compression were also investigated. It was found that if the gas charge be augmented by 30 per cent., the total loss of heat will be increased by 50 per cent., with a corresponding increase in the temperatures of the piston and inlet valve. Retarding the ignition by 20°, the gas charge and other circumstances remaining the same, reduces the total heat loss by 10 per cent., and the thermal efficiency is reduced from 34½ to 28½ per cent. Advancing the ignition by 10 per cent. has little effect upon efficiency. Comparative trials were made in which the engine was run first in the ordinary way and afterwards with the half-compression cam used for starting purposes kept in action. The result in the latter case was that about two-fifths of the charge of gas and air was expelled unburnt to the exhaust.

Finally, a large number of experiments were made on the phenomena of pre-ignition. In order to cause the engine to pre-ignite, an iron bolt carrying a thermocouple at its end was introduced into the combustion chamber. The end of this bolt was heated by the explosions, and it was found that it could be heated in this way up to a temperature of about 700° C. without affecting in any way the working of the engine, but that if the temperature exceeded 730° C. ignitions would take place from the end of the bolt. The effect of these ignitions is to heat up the end of the bolt more rapidly than before. They thus tend to propagate themselves and to become more frequent, and if once they start, the engine is bound to pull up. It was found that the line of division between the conditions under which safe and continuous running was possible, and those under which the engine was bound to pull up was very narrow, and could be represented by an increase in the gas charge of only 1 per cent. This instability is due to the fact that the gas near the point of ignition of an explosive mixture is heated to a temperature much above the mean by the rise of pressure which follows its ignition. Thus the fact that ignition takes place through the bolt tends of itself to make the bolt hotter, and so to cause earlier and more frequent ignitions from the bolt.

Items of Interest
FROM VARIOUS LOCALITIES.

"L. R.," writing from Kansas City, Mo., under date of the 12th inst., incloses the following: "An automobile caused this week a most unusual accident in this city. In fact, I have never heard of an accident that in any sense resembled it, and I have been connected with concerns that have had to do with gas and water pipe laying on a large scale for many years. The car was passing over an open manhole at 12th and Baltimore streets, this city, where workmen were repairing a leaky gas main, when a spark from the machine caused an explosion of the gases issuing from the chamber of the manhole. There was a sharp flash accompanied by a dull roar, and out of the mist a workman (W. A. Thompson) emerged, whose face and hands were badly burned, and whose hair was singed, almost to the scalp and lips. The workman will recover, and the pipe was sadly twisted, but the offending power carriage was not even scratched."

THE Oklahoma House of Representatives has passed the measure which authorizes the Corporations' Commission to fix the prices of gas and electricity, to employ inspectors—in fact, putting upon the Commission complete power to supervise the business of gas and electric lighting supply.

THE Springfield (Mass.) Gas Light Company is proposing to construct, on a site owned by it on West State street for some years, a 2-story office building to be put up on a scale that will cause it to become one of the features of the business building section of the city. The detail plans have not yet been made public, but the cost of the structure will not be less than $30,000.

IT is likely that the foreclosure proceedings brought by the American Trust and Savings Bank and others against the Citizens Gas Light Company, of Nebraska City, Neb., will result in a sale of the plant, without prejudice. The Company has been in the hands of a receiver (February, 1908) for some time, and despite the careful attention of that official (Mr. Horace G. Leigh) the property has failed to earn the interest on its bonds. If the plant is purchased by the bondholders, and it certainly appears that they will have to take it up, in that event the plant will undoubtedly be reconstructed, for it certainly is in bad shape at this time of writing.

THE Public Service Commission, Second District, New York, has assented to the pleas of certain capitalists, asking that the owners of the Watertown Gas Light Company and of the Watertown Light and Power Company, under which it is proposed to amalgamate and centralize the adjacent lighting trade of the named city.

MESSRS. R. D. WOOD & Co. have been awarded the contract for the construction of a 300,000 cubic foot storage holder, to be erected in the Edwardsville district of the Luzerne County (Pa.) Gas and Electric Company.

THE following is the text of an ordinance providing for the inspection of gas meters, and to regulate the payment of a fee for such inspection and regulation in Memphis, Tenn.:

SECTION 1. But it is ordained by the Legislative Council of the city of Memphis, that a fee shall be charged for inspecting or re-inspecting, sealing and stamping gas meters.

THE sendout of the Freeport (Ills.) Gas Light and Coke Company has been increasing so rapidly that Mr. Z. T. F. Runner, the Company's General Manager, has been obliged to keep all of the benches running full time to meet the demands of his customers. Indeed, so great and insistent have these demands become that the Manager recently entered into a contract with the Gas Machinery Company, of Cleveland, O., for the placing of a 6-foot water gas set, the apparatus complete to include an exhauster, tar extractor, oil tank and all the necessary piping.

"RALEIGH," writing to the JOURNAL from Wilmington, N. C., the afternoon of the 15th inst., says: "Through the ingenuity and ardent perseverance on the part of Capt. S. E. Linton, General Manager of the Standard Gas and Electric Company, of Raleigh, N. C., 36 Humphrey outside arcs, of the 400-candle power type, are lighting and adorning part of Fayetteville street, the main street of the Capital City of North Carolina. The line extends from the State House to Davis street, a distance of 6 blocks. Gas was first turned on to the lamps the evening of the 11th inst., and every person who was 'out that evening,' having witnessed the illumination in all its effectiveness, declared it was the most complete exemplification of street lighting that Raleighites ever witnessed in their home city. The City Fathers, too, are pointing with pride over that which they had so well initiated. A peculiar feature about this public lighting contract was that this particular district was primarily planned by the local electric lighting company, and the specifications were not particularly favorable towards having the Gas Company to bid on the set scheme. However, when Captain Linton had explained to the authorities that which his Company could and would do in respect of the best illumination by means of gas, it was allowed to enter the competition. The result was the present exhibition, which is certainly up-to-date in every sense."

THE Boston newspapers of the 16th inst. contained the announcement that the report of Henry A. Wyman, Master in the Bay State Gas Company, involving the compensation to be paid to 13 attorneys in the income bondholders' suit, already settled, will file his report with the court on March 31. The report is already in the hands of counsel for the purpose of giving them an opportunity to file objections. The court has reserved over $200,000 of the surplus funds of the Bay State Gas Company to be used for payment of fees as recommended by the Master, but all of this fund is not expected to be used for that account. A small balance should be left for the Company.

The Master's report, as submitted to counsel, covers about 200 pages of closely printed matter and is decidedly favorable to the Company. Out of a total of approximately $225,000 asked for by the lawyers, the Master awards something under $85,000. The principal claim, that for $125,000, filed by G. Godfrey Patterson and Henry Major, of New York, for 10 years' service, dating back to the filing of the original bill of complaint, was cut to about $60,000. Morse and Friedman, leading counsel in the intervening bondholders' suit, were awarded about $9,000 instead of the $35,000 sought. The Master's report will not settle the matter, however. Counsel will file exceptions with Judge Putnam, and he will give a hearing on the acceptance of the report on April 1, 2 and 3."

A CORRESPONDENT in Boston forwards the following under date of the 13th inst.: "Last Thursday, before the Committee on Public Lighting at Boston, Senator Hullman in the Chair, a hearing was held on the bill, No. 695, which originated in the lower House, which has to do with the gas supply of Fall River. The city was represented by Mayor Coughlin, City Solicitor Dubuque, and the peripatetic Alton D. Adams, of Worcester, 'expert.' The Gas Company's interests were represented by Attorney Hunt and Manager Nute, whose expertness in gas matters was gained within a gas works. When the hearing had gotten down to actual business, Mr. Dubuque offered a substitute bill. The 80-cent rate clause was retained, but the pressure features provided for a maximum pressure of 1½ inches of water at the outlet of consumers' meters. Pressure in excess of this was to render the Company liable to a fine of $100 for each violation, which penalty was recoverable by suits separately brought. The hearing lasted over 2 hours, most of which time was taken up by expert Adams, who aired once more his odd views on pressure conditions in particular, and on gas practice in general. Some of his figures in connection with a test made by him to show that at the pressures under which gas was supplied to the consumers by the Fall River Company, an economical supply was impossible, were ridiculous. No evidence was given by the Company in opposition to the bill, Attorney Hunt being satisfied to agree along the line that the bill was indicative of special legislation of the most objectionable type, and that this question required judicial inquiry not to be furnished by a legislative committee, that there had been only one complaint made to the Commission in 10 years, showing very little dissatisfaction, and that the question of pressure was of detailed engineering, and that the dividends paid by the Company in 15 years were not excessive, but represented only about 6 per cent. of the market value of the stock."

THE result of the annual election for Directors to govern the affairs of the Nashville (Tenn.) Gas Company for the ensuing year favored the existing Board, under whose management the Company does not seem to thrive particularly. The contest was a keen one. The persons elected as Directors are: D. S. Williams, J. H. Fall, J. B. Richardson, B. F. Wilson, J. H. Thompson, W. R. Cole, A. H. Robinson, T. H. Malone, Jr., and T. J. O'Keefe.

THE residents of Cainsville, Mo., will be called upon shortly to vote on a proposition permitting the Keystone Oil and Gas Company to operate a fuel gas plant in that district. To enable this to be done the voters will pass upon the proposition next mouth.

DURING the first week in which the Consolidated Gas Company, of New York, was engaged in paying out the "suspense fund," representing the difference of 20 cents per 1,000 cubic feet withheld during the time the validity of the 80-cent gas rate in this city was being determined in the courts, the sum of $530,664.79 was returned to consumers, as per the statement issued by Mr. John A. Shields, U. S. Commissioner for the District of New York. In continuing his presentation, that might not be improperly labelled "one week after," the Commissioner says: "Of the amount thus disbursed the Consolidated Company paid out $392,782.22, of which, approximately, 71 per cent. was paid out of the Special Master's fund and 29 per cent. direct by the Company, being collections for overcharge which had not been deposited. We are satisfied with the progress made. No accurate calculation as to the future can be made merely from these results; probably they will fall off for 2 or 3 weeks, but as the work progresses and the men who are classifying the items on the papers for refund, so as to bring each consumer's separate payments together, get through that part of the work, changes will be possible which may be expected greatly to facilitate the preparation of vouchers and checks. I see no reason to doubt that in all cases, where there are no complications from changes of address, assignments, claims of alleged creditors, etc., a very few months will complete their payment."

THE report of the Brooklyn Union (N. Y.) Gas Company, for the year ended December 31st, 1908, is thus summarized in the local papers—a study of the figures will show how and where some queer conclusions could be drawn from them:

	1908.	Increase.
Gross earnings	$7,977,894	$597,090
Operating expenses	4,863,408	185,563
Net earnings	$3,114,486	$401,527
Taxes	445,568	59,598
Balance	$2,668,918	$351,929
Other income	122,443	10,693
Total income	$2,791,361	$362,622
Interest and insurance	966,270	*6,811
Balance for div.	$1,825,091	$369,433
Dividends	839,520	839,520
Balance	$985,571	*$470,087
Depreciation. etc.	1,022,785	76,234
Deficit	$37,214	$546,321

* Decrease.

MESSRS. H. M. BYLLESBY & Co. have announced the declaring of a dividend of 1 per cent. on the common stock of the San Diego (Cal.) Gas and Electric Company, payable since the 15th inst.

AN echo of the uusalted stay of Mr. W. S. Jackson in the office of the State Attorney-General is shown in a recent decision given by the Appellate Division, State of New York, sitting in review of Special Term. The Division refused to grant the State permission to maintain an action to have the courts adjudge that the grants for the use of the streets had expired, and to enjoin the Company from exercising any rights themselves. Judge Laughlin, who wrote the opinion, holds that the question of whether the grants and franchises have expired is a local one, and that if the Company have no right to have the mains in the streets a suit in equity could be maintained by the city to compel their removal. It is held that the cases where franchises or grants have expired it is for the city authorities to decide whether to let the matter rest on an implied consent to take action.

THE Governing Committee of the New York Stock Exchange has assented to the recommendations of the Committee on Stock List that $24,000 first mortgage 5 per cent. coupon bonds, maturing October 2, 1921, of the New York and Richmond Gas Company, of Staten Island, N. Y., be added to the existing list, making the total amount the amount of the authorized issue of $1,500,000. The statement furnished by the Company, as to its financial standing and physical condition at the present time, is truly remarkable evidence of the growth of this Company. For instance, since the present owners took hold the number of meters installed went up to 9,455, from 3,046; the distribution system now shows a total of 83.80 miles, as against 55.25 miles in 1902. The sendout has increased something over 100 per cent. between times, and the Company is the owner of a plant that for completeness is as remarkable as its predecessor was noted for its incompleteness. Meanwhile Manager Horton retains his self-possession and modest demeanor.

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water. According to theory, the excess of the temperature at any point over the mean temperature of this water should be proportional to the total heat loss, except in so far as the distribution of this loss over the metal surface exposed to the hot gas is altered. By changing the strength of mixture, keeping other conditions the same, the heat loss was varied between limits of about 1,300 and 2,200 B.T.U. per minute—the engine firing practically every time, and it was found that the piston temperature was very closely proportional to the loss of heat. Under normal working conditions at full load, the temperature at the center of the piston was found to be about 370° C. above that of the jacket water; in the exhaust valve, 400° C.; and in the inlet valve, 250° C.

The next group of experiments related to the effect of varying the conditions of running upon the temperature of the metal. The dependence of heat flow and temperature upon the strength of the mixture, the time of ignition, and the degree of compression were also investigated. It was found that if the gas charge be augmented by 30 per cent., the total loss of heat will be increased by 50 per cent., with a corresponding increase in the temperatures of the piston and inlet valve. Retarding the ignition by 20°, the gas charge and other circumstances remaining the same, reduces the total heat loss by 10 per cent., and the thermal efficiency is reduced from 34½ to 28½ per cent. Advancing the ignition by 10 per cent. has little effect upon efficiency. Comparative trials were made in which the engine was run first in the ordinary way and afterwards with the half-compression cam used for starting purposes kept in action. The result in the latter case was that about two-fifths of the charge of gas and air was expelled unburnt to the exhaust.

Finally, a large number of experiments were made on the phenomena of pre-ignition. In order to cause the engine to pre-ignite, an iron bolt carrying a thermocouple at its end was introduced into the combustion chamber. The end of this bolt was heated by the explosions, and it was found that it could be heated in this way up to a temperature of about 700° C. without affecting in any way the working of the engine, but that if the temperature exceeded 730° C. ignitions would take place from the end of the bolt. The effect of these ignitions is to heat up the end of the bolt more rapidly than before. They thus tend to propagate themselves and to become more frequent, and if once they start, the engine is bound to pull up. It was found that the line of division between the conditions under which safe and continuous running was possible, and those under which the engine was bound to pull up was very narrow, and could be represented by an increase in the gas charge of only 1 per cent. This instability is due to the fact that the gas near the point of ignition of an explosive mixture is heated to a temperature much above the mean by the rise of pressure which follows its ignition. Thus the fact that ignition takes place through the bolt tends of itself to make the bolt hotter, and so to cause earlier and more frequent ignitions from the bolt.

Items of Interest
FROM VARIOUS LOCALITIES.

"L. R.," writing from Kansas City, Mo., under date of the 12th inst., incloses the following: "An automobile caused this week a most unusual accident in this city. In fact, I have never heard of an accident that in any sense resembled it, and I have been connected with concerns that have had to do with gas and water pipe laying on a large scale for many years. The car was passing over an open manhole at 12th and Baltimore streets, this city, where workmen were repairing a leaky gas main, when a spark from the machine caused an explosion of the gases issuing from the chamber of the manhole. There was a sharp flash accompanied by a dull roar, and out of the mist a workman (W. A. Thompson) emerged, whose face and hands were badly burned, and whose hair was singed, almost to the scalp and lips. The workman will recover, and the pipe was sadly twisted, but the offending power carriage was not even scratched."

THE Oklahoma House of Representatives has passed the measure which authorizes the Corporations' Commission to fix the prices of gas and electricity, to employ inspectors—in fact, putting upon the Commission complete power to supervise the business of gas and electric lighting supply.

THE Springfield (Mass.) Gas Light Company is proposing to construct, on a site owned by it on West State street for some years, a 2-story office building to be put up on a scale that will cause it to become one of the features of the business building section of the city. The detail plans have not yet been made public, but the cost of the structure will not be less than $30,000.

IT is likely that the foreclosure proceedings brought by the American Trust and Savings Bank and others against the Citizens Gas Light Company, of Nebraska City, Neb., will result in a sale of the plant, without prejudice. The Company has been in the hands of a receiver (February, 1908) for some time, and despite the careful attention of that official (Mr. Horace G. Leigh) the property has failed to earn the interest on its bonds. If the plant is purchased by the bondholders, and it certainly appears that they will have to take it up, in that event the plant will undoubtedly be reconstructed, for it certainly is in bad shape at this time of writing.

THE Public Service Commission, Second District, New York, has assented to the pleas of certain capitalists, asking that the owners of the Watertown Gas Light Company and of the Watertown Light and Power Company, under which it is proposed to amalgamate and centralize the adjacent lighting trade of the named city.

MESSRS. R. D. WOOD & CO. have been awarded the contract for the construction of a 300,000 cubic foot storage holder, to be erected in the Edwardsville district of the Luzerne County (Pa.) Gas and Electric Company.

THE following is the text of an ordinance providing for the inspection of gas meters, and to regulate the payment of a fee for such inspection and regulation in Memphis, Tenn.:

SECTION 1. But it is ordained by the Legislative Council of the city of Memphis, that a fee shall be charged for inspecting or re-inspecting, sealing and stamping gas meters.

THE sendout of the Freeport (Ills.) Gas Light and Coke Company has been increasing so rapidly that Mr. Z. T. F. Runner, the Company's General Manager, has been obliged to keep all of the benches running full time to meet the demands of his customers. Indeed, so great and insistent have these demands become that the Manager recently entered into a contract with the Gas Machinery Company, of Cleveland, O., for the placing of a 6-foot water gas set, the apparatus complete to include an exhauster, tar extractor, oil tank and all the necessary piping.

"RALEIGH," writing to the JOURNAL from Wilmington, N. C., the afternoon of the 15th inst., says: "Through the ingenuity and ardent perseverance on the part of Capt. S. E. Linton, General Manager of the Standard Gas and Electric Company, of Raleigh, N. C., 36 Humphrey outside arcs, of the 400-candle power type, are lighting and adorning part of Fayetteville street, the main street of the Capital City of North Carolina. The line extends from the State House to Davis street, a distance of 6 blocks. Gas was first turned on to the lamps the evening of the 11th inst., and every person who was 'out that evening,' having witnessed the illumination in all its effectiveness, declared it was the most complete exemplification of street lighting that Raleighites ever witnessed in their home city. The City Fathers, too, are pointing with pride over that which they had so well initiated. A peculiar feature about this public lighting contract was that this particular district was primarily planned by the local electric lighting company, and the specifications were not particularly favorable towards having the Gas Company to bid on the set scheme. However, when Captain Linton had explained to the authorities that which his Company could and would do in respect of the best illumination by means of gas, it was allowed to enter the competition. The result was the present exhibition, which is certainly up-to-date in every sense."

THE Boston newspapers of the 16th inst. contained the announcement that the report of Henry A. Wyman, Master in the Bay State Gas Company, involving the compensation to be paid to 13 attorneys in the income bondholders' suit, already settled, will file his report with the court on March 31. The report is already in the hands of counsel for the purpose of giving them an opportunity to file objections. The court has reserved over $200,000 of the surplus funds of the Bay State Gas Company to be used for payment of fees as recommended by the Master, but all of this fund is not expected to be used for that account. A small balance should be left for the Company.

The Master's report, as submitted to counsel, covers about 200 pages of closely printed matter and is decidedly favorable to the Company. Out of a total of approximately $225,000 asked for by the lawyers, the Master awards something under $85,000. The principal claim, that for $125,000, filed by G. Godfrey Patterson and Henry Major, of New York, for 10 years' service, dating back to the filing of the original bill of complaint, was cut to about $60,000. Morse and Friedman, leading counsel in the intervening bondholders' suit, were awarded about $9,000 instead of the $35,000 sought. The Master's report will not settle the matter, however. Counsel will file exceptions with Judge Putnam, and he will give a hearing on the acceptance of the report on April 1, 2 and 3."

A CORRESPONDENT in Boston forwards the following under date of the 13th inst.: "Last Thursday, before the Committee on Public Lighting at Boston, Senator Hullman in the Chair, a hearing was held on the bill, No. 695, which originated in the lower House, which has to do with the gas supply of Fall River. The city was represented by Mayor Coughlin, City Solicitor Dubuque, and the peripatetic Alton D. Adams, of Worcester, 'expert.' The Gas Company's interests were represented by Attorney Hunt and Manager Nute, whose expertness in gas matters was gained within a gas works. When the hearing had gotten down to actual business, Mr. Dubuque offered a substitute bill. The 80-cent rate clause was retained, but the pressure features provided for a maximum pressure of 1½ inches of water at the outlet of consumers' meters. Pressure in excess of this was to render the Company liable to a fine of $100 for each violation, which penalty was recoverable by suits separately brought. The hearing lasted over 2 hours, most of which time was taken up by expert Adams, who aired once more his odd views on pressure conditions in particular, and on gas practice in general. Some of his figures in connection with a test made by him to show that at the pressures under which gas was supplied to the consumers by the Fall River Company, an economical supply was impossible, were ridiculous. No evidence was given by the Company in opposition to the bill, Attorney Hunt being satisfied to agree along the line that the bill was indicative of special legislation of the most objectionable type, and that this question required judicial inquiry not to be furnished by a legislative committee, that there had been only one complaint made to the Commission in 10 years, showing very little dissatisfaction, and that the question of pressure was of detailed engineering, and that the dividends paid by the Company in 15 years were not excessive, but represented only about 6 per cent. of the market value of the stock."

THE result of the annual election for Directors to govern the affairs of the Nashville (Tenn.) Gas Company for the ensuing year favored the existing Board, under whose management the Company does not seem to thrive particularly. The contest was a keen one. The persons elected as Directors are: D. S. Williams, J. H. Fall, J. B. Richardson, B. F. Wilson, J. H. Thompson, W. R. Cole, A. H. Robinson, T. H. Malone, Jr., and T. J. O'Keefe.

THE residents of Cainsville, Mo., will be called upon shortly to vote on a proposition permitting the Keystone Oil and Gas Company to operate a fuel gas plant in that district. To enable this to be done the voters will pass upon the proposition next mouth.

DURING the first week in which the Consolidated Gas Company, of New York, was engaged in paying out the "suspense fund," representing the difference of 20 cents per 1,000 cubic feet withheld during the time the validity of the 80-cent gas rate in this city was being determined in the courts, the sum of $530,664.79 was returned to consumers, as per the statement issued by Mr. John A. Shields, U. S. Commissioner for the District of New York. In continuing his presentation, that might not be improperly labelled "one week after," the Commissioner says: "Of the amount thus disbursed the Consolidated Company paid out $392,782.22, of which, approximately, 71 per cent. was paid out of the Special Master's fund and 29 per cent. direct by the Company, being collections for overcharge which had not been deposited. We are satisfied with the progress made. No accurate calculation as to the future can be made merely from these results; probably they will fall off for 2 or 3 weeks, but as the work progresses and the men who are classifying the items on the papers for refund, so as to bring each consumer's separate payments together, get through that part of the work, changes will be possible which may be expected greatly to facilitate the preparation of vouchers and checks. I see no reason to doubt that in all cases, where there are no complications from changes of address, assignments, claims of alleged creditors, etc., a very few months will complete their payment."

THE report of the Brooklyn Union (N. Y.) Gas Company, for the year ended December 31st, 1908, is thus summarized in the local papers—a study of the figures will show how and where some queer conclusions could be drawn from them:

	1908.	Increase.
Gross earnings	$7,977,894	$597,090
Operating expenses	4,863,408	185,563
Net earnings	$3,114,486	$401,527
Taxes	445,568	59,598
Balance	$2,668,918	$351,929
Other income	122,443	10,693
Total income	$2,791,361	$362,622
Interest and insurance	966,270	*6,811
Balance for div.	$1,825,091	$369,433
Dividends	839,520	839,520
Balance	$985,571	*$470,087
Depreciation, etc.	1,022,785	76,234
Deficit	$37,214	$546,321

* Decrease.

MESSRS. H. M. BYLLESBY & Co. have announced the declaring of a dividend of 1 per cent. on the common stock of the San Diego (Cal.) Gas and Electric Company, payable since the 15th inst.

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The Market for Gas Securities.

The improvement in Consolidated gas continues, and quite some good cash purchases for investment are reported to have been made. The stock opened to-day (Friday) at 129, and was 129½ bid by noon. If the readjustment on account of the ownership in city electric lighting concerns is proceeded with—and it is said that important steps will be taken thereto late this spring—Consolidated will go again, and rapidly, to its recent high level.

Brooklyn Union is 126 to 130. Peoples, of Chicago, is 112 to 112½, and Massachusetts Gas Companies still feels the impulse of continued inquiry for small lots.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MARCH 22.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated Gas Co.	$73,177,000	100	129½	130
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	145	155
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98¼	99¼
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	126	130
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91½	92
Yonkers	299,650	500	130	—
Out-of Town Companies.				
Bay State	50,000,000	50	1¼	1⅝
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	509,000	1,000	90	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	60	60½
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	91½	92
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,028,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	—	100
Preferred	2,500,000	100	60	90
Bonds	10,000,000	1,000	104	104½
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,370,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108½
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	64	64¼
Preferred	25,000,000	100	92½	92¾

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ANNUAL MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, February 15, 1909.

The Annual Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Monday, May 3, 1909, at 12 o'clock, noon, for the purpose of electing a President and six Directors, to serve for the ensuing year, considering and acting upon the subject of a proposed increase in the capital stock of the Company from 918,005 shares of the par value of $50 each, to 1,009,467 shares of the par value of $50 each, and transacting such other business as may properly come before the meeting. The stock transfer books will be closed from 3 P.M., April 31, 1909, until 9 A.M., May 4, 1909. By order of the Board of Directors.

1759-5 W. F. DOUTHIRT, Secretary.

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., March 10, 1909.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1909, to stockholders of record at the close of business, March 31, 1909. Checks will be mailed.

1762-5 LEWIS LILLIE, Treasurer.

CITY OF BALTIMORE, LAMPS AND LIGHTING DEPARTMENT.

To Manufacturers of Street Lamp Burners and Fixtures:

The Superintendent of Lamps and Lighting of the City of Baltimore, City Hall, desires to purchase incandescent gas and gasoline lamp burners for street lighting purposes—the burners to produce a light equal to between 55 and 60-candle power.

In addition to the above and with a view to the improvement of the present equipment, information is desired concerning the most modern type of incandescent gas and naphtha street lighting fixtures and the terms upon which such fixtures can be obtained by the city.

In order to demonstrate the light-giving power and the artistic appearance of such equipment, tests and street exhibitions may be made, if necessary.

SUPERINTENDENT OF LAMPS AND LIGHTING,
1761-4 Baltimore, Md.

Position Wanted

By a Good Working Foreman

On water or coal gas, or both. Fifteen years' practical experience. Best results attained or no salary expected. Open to accept at once.

Address, "M. T.,"
1762-2 Care this Journal.

Position Wanted.

A young married man, 25 years of age, would like position as water gas maker or all-round gas man. Now employed in a large plant. Ten years' practical experience. Address, "GENERATOR,"
1763-1 Care this Journal.

Position Wanted.

Up-to-Date Meter Man, as Foreman or Repairer.

Fifteen years' experience. A-1 references. Correspondence solicited.

1763-1 Address, "S. R. B.," care this Journal.

WANTED,

Position as Solicitor or Manager of New Business Department.

Twelve years' experience and best of references. Can take charge of any branch of a gas company. Will be at liberty after April 15 h. Address, "SOLICITOR,"
1762-2 Care this Journal.

Position Wanted

As Superintendent,

By a competent gas man who has had practical experience in all branches of the business, both coal and water gas. At present employed. A-1 references.

1755-tf Address, "R. C.," care this Journal.

POSITION WANTED

As Superintendent,

By a competent, practical man, experienced in all details, with a company that will appreciate close application to business. Either gas or combined gas and electric plant, Middle West preferred. Address, "K. K.,"
1761-4 Care this Journal.

Position Wanted

As Manager or Superintendent,

By competent gas man, 35 years of age, married, strictly sober, with operating experience both as manager and superintendent in actual charge of plants. A man who can show and give results; 17 years' experience; now acting as manager of coal gas plant in city of 15,000. Will have to give present people 60 days' notice. Address,
1737-eot-tf "RESULTS," care this Journal.

Wanted, Position

As Superintendent or Manager.

An experienced manager desires a position as superintendent or manager of either coal or water gas plant. Best of references.

Address, "T. B.,"
1763-2 Care this Journal.

Position Wanted.

An experienced gas accountant would like position. Capable of taking entire charge of office. Can furnish best of references.

1763-1 Address, "L. E. C.," care this Journal.

Position Wanted.

ALL-ROUND GASFITTER, COMPLAINT AND WELSBACH MAN.

Can furnish best of references.

1763-1 Address, "W. J. F.," care this Journal.

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In a Southern city of 50,000 population. We want a worker who can land the business and who understands fully both the lighting and fuel ends. Address, stating age, references, salary expected, etc., to "COMPETENT,"
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East Ohio Gas Co., Cleveland, O.
Edison Phonograph Co., Orange, N. J.
Illinois Steel Co., Joliet, Ill.
Bartlett, Hayward & Co., Baltimore, Md.
American Coke and Gas Construction Co., Camden, N. J.
Kerr Murray Mfg. Co., Fort Wayne, Ind.
Philadelphia Suburban Gas Co., Chester, Pa.
Quebec (Can) Gas Co.
And others.

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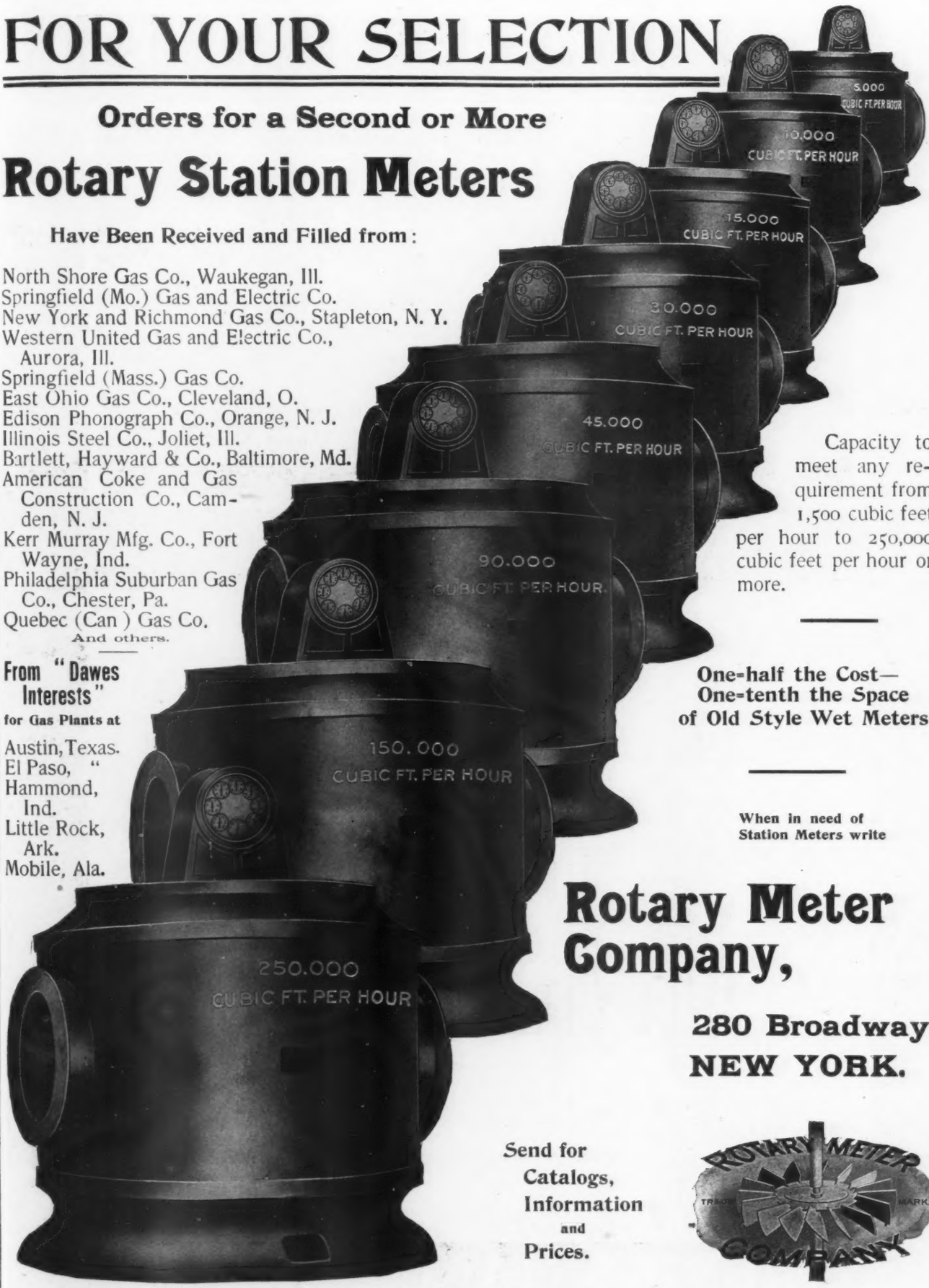
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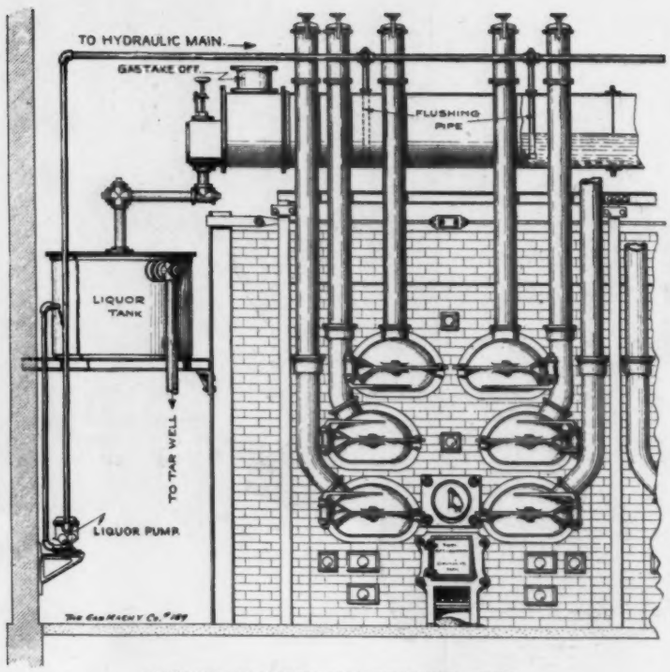

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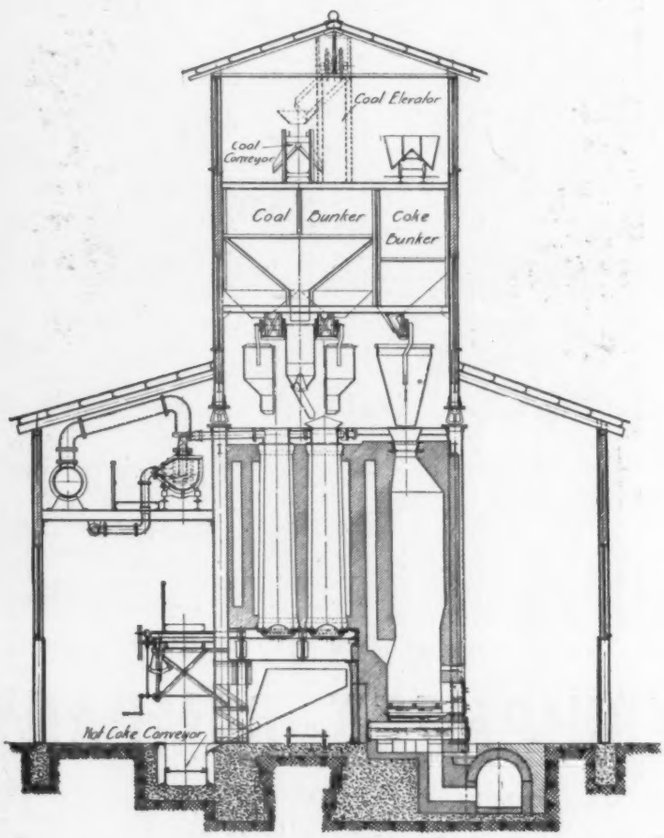

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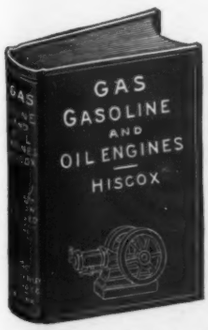

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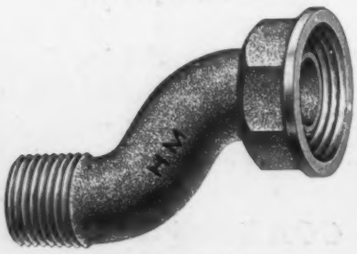
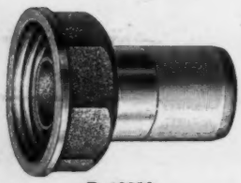


(Patent Applied for.)
D-18804.

STRAIGHT, PLAIN.



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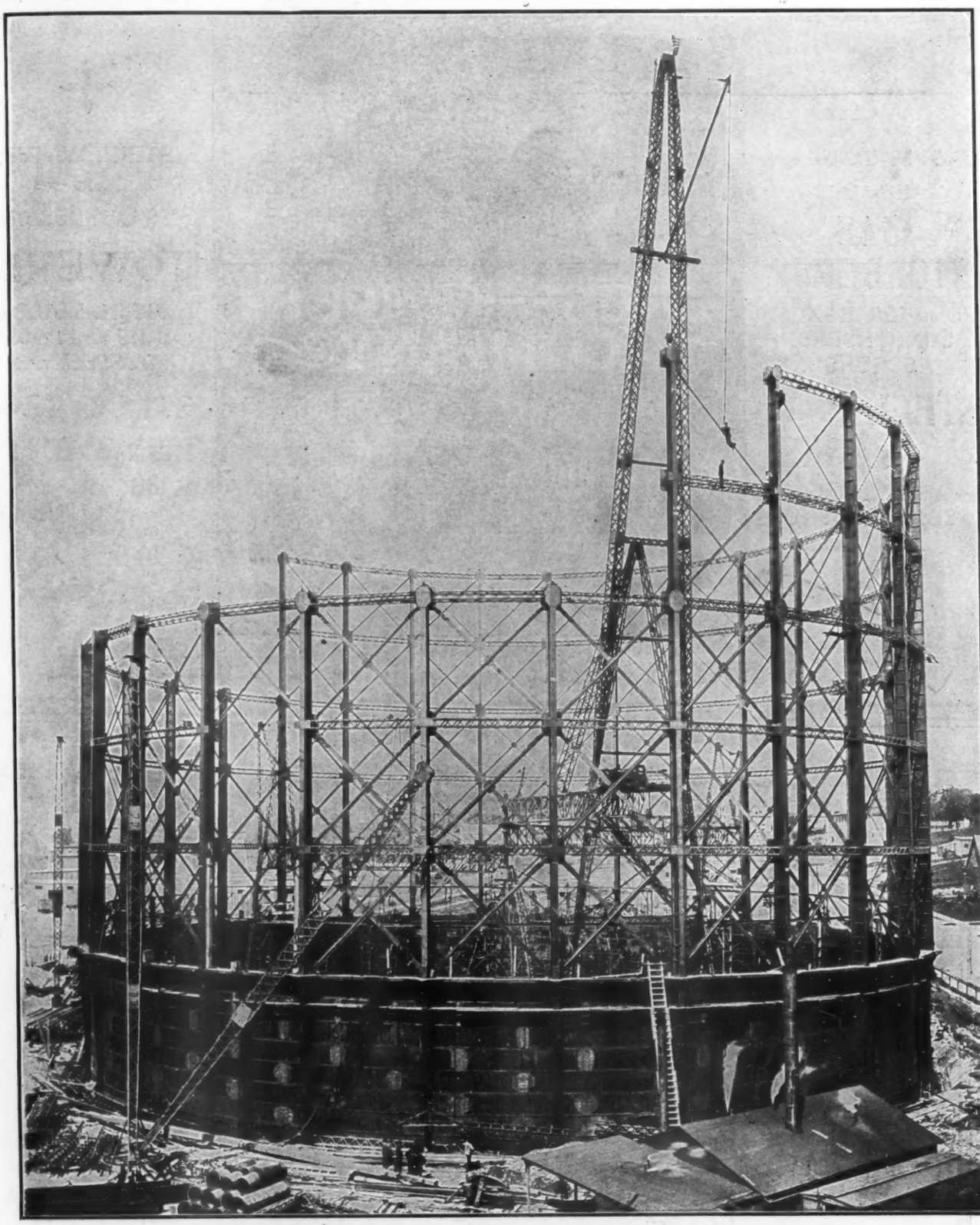

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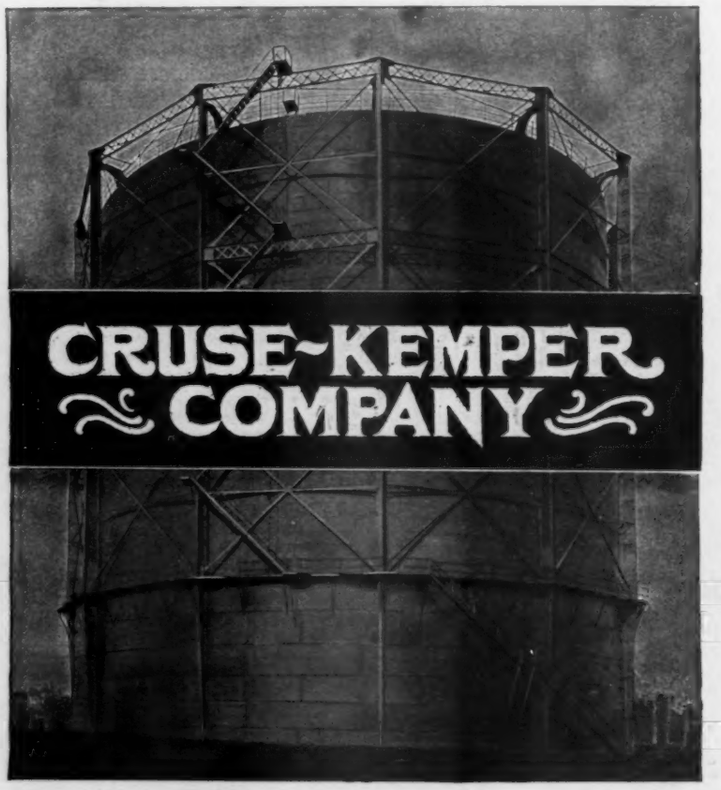

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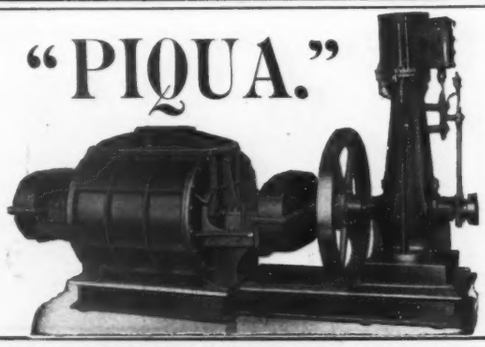

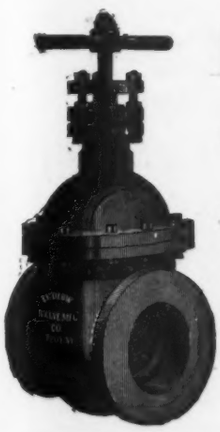

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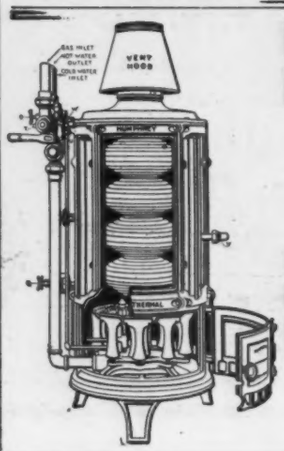

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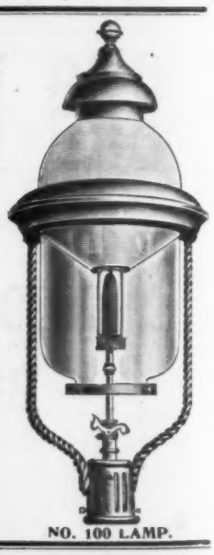

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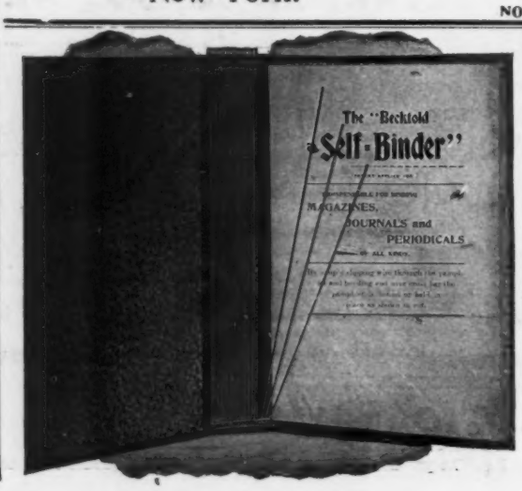

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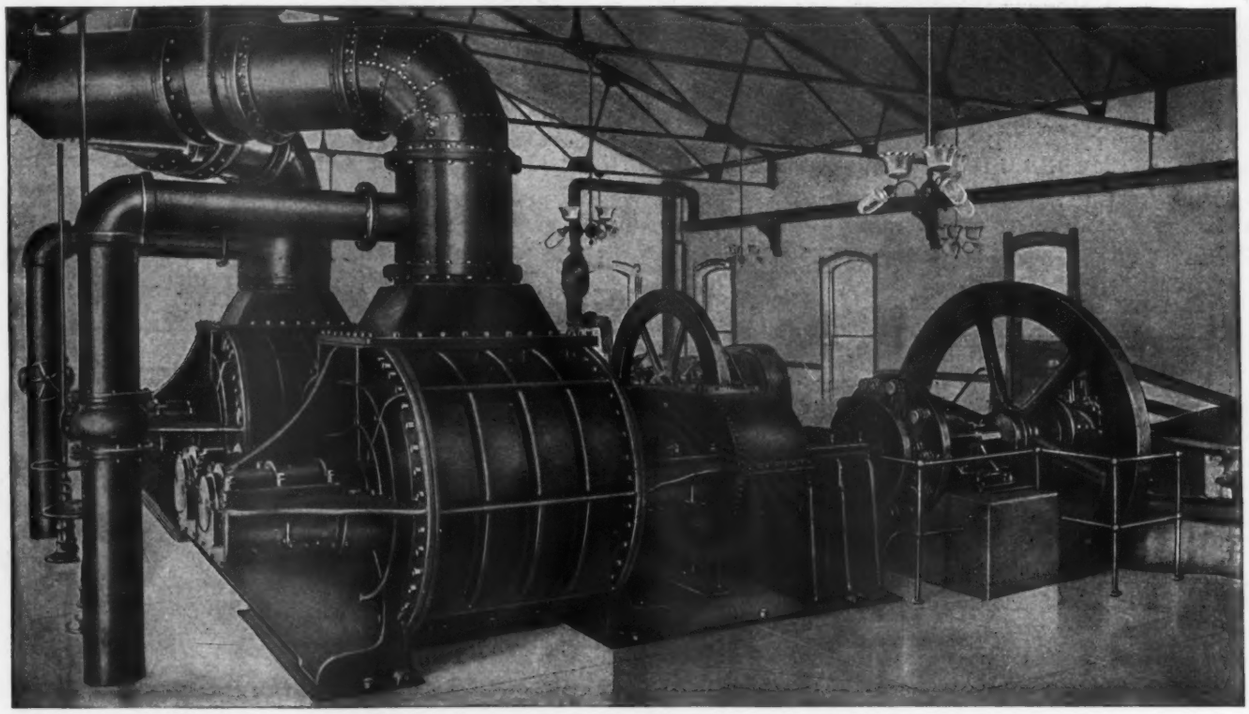

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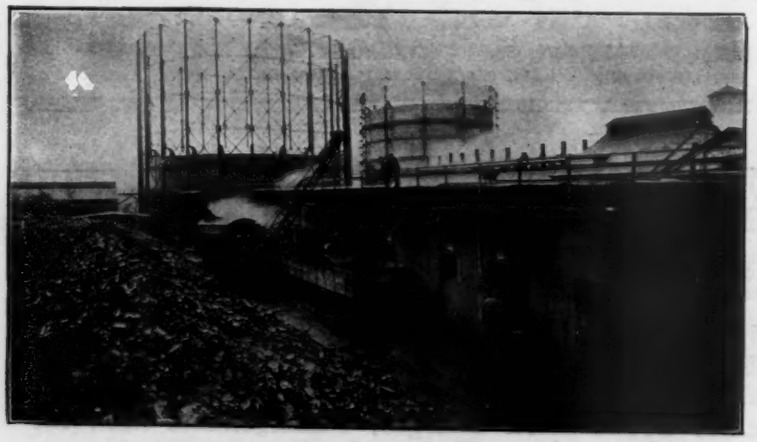

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PUBLIC LIGHTING TABLE.

APRIL, 1909.

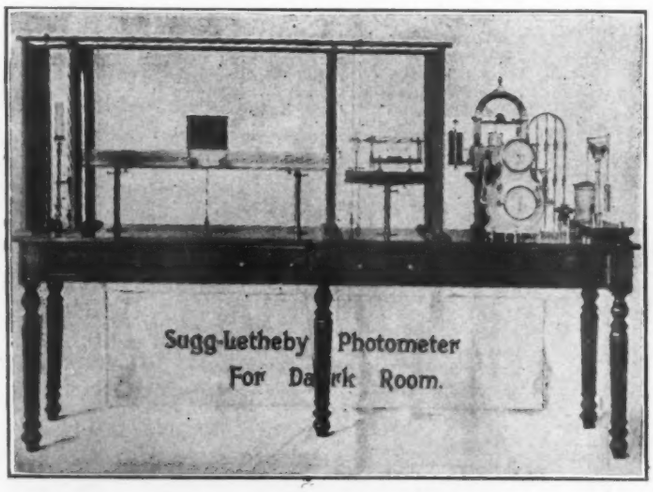
Table No. 1.
FOLLOWING THE MOON.

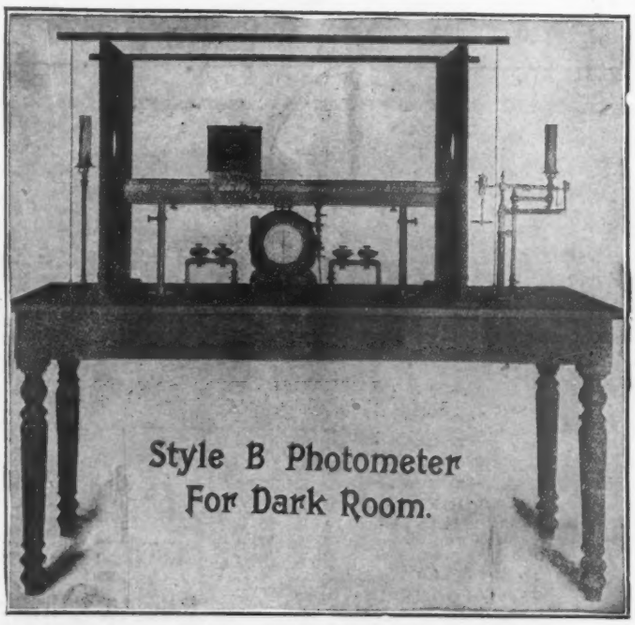
Day of Week.	Date.	Light.	Extinguish.
Thu.	1	3.40AM	4.50AM
Fri.	2	4.10	4.50
Sat.	3	4.30	4.50
Sun.	4	No L.	No L.
Mon.	5	No L.FM	No L.
Tue.	6	No L.	No L.
Wed.	7	7.00PM	9.20PM
Thu.	8	7.00	10.20
Fri.	9	7.00	11.30
Sat.	10	7.00	12.30AM
Sun.	11	7.10	1.30
Mon.	12	7.10	2.30
Tue.	13	7.10LQ	3.20
Wed.	14	7.10	4.00
Thu.	15	7.10	4.20
Fri.	16	7.10	4.20
Sat.	17	7.10	4.20
Sun.	18	7.10	4.10
Mon.	19	7.10NM	4.10
Tue.	20	7.10	4.10
Wed.	21	7.10	4.10
Thu.	22	7.10	4.10
Fri.	23	7.10	4.10
Sat.	24	11.00	4.10
Sun.	25	11.50	4.00
Mon.	26	12.40FM	4.00
Tue.	27	1.10	4.00
Wed.	28	1.40	4.00
Thu.	29	2.10	4.00
Fri.	30	2.30	4.00

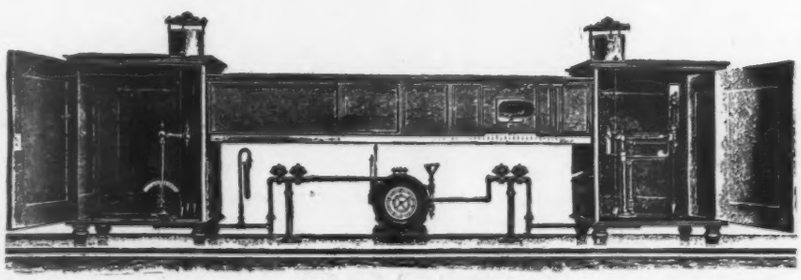
TOTAL HOURS DURING 1909.

By Table No. 1.

	Hrs.Min.
January	212.20
February	183.40
March	173.00
April	151.10
May	144.10
June	138.50
July	145.40
August	160.30
September	180.00
October	201.00
November	216.30
December	233.40
Total, yr.	2140.30







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PUBLIC LIGHTING TABLE.

APRIL, 1909.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Complete Lighting in One Hour	Complete Extinguishing in 50 Minutes
		From Time Given	
		P. M.	A.M.
Thu.	1	5.57	4.47
Fri.	2	6.07	4.37
Sat.	3	6.07	4.37
Sun.	4	6.07	4.37
Mon.	5	6.07	4.37
Tue.	6	6.07	4.32
Wed.	7	6.07	4.32
Thu.	8	6.07	4.32
Fri.	9	6.17	4.22
Sat.	10	6.17	4.22
Sun.	11	6.17	4.22
Mon.	12	6.17	4.22
Tue.	13	6.17	4.22
Wed.	14	6.17	4.22
Thu.	15	6.17	4.22
Fri.	16	6.27	4.17
Sat.	17	6.27	4.17
Sun.	18	6.27	4.17
Mon.	19	6.27	4.12
Tue.	20	6.27	4.12
Wed.	21	6.27	4.12
Thu.	22	6.27	4.12
Fri.	23	6.37	4.02
Sat.	24	6.37	4.02
Sun.	25	6.37	4.02
Mon.	26	6.37	4.02
Tue.	27	6.37	4.02
Wed.	28	6.37	4.02
Thu.	29	6.37	4.02
Fri.	30	6.47	3.52

TOTAL HOURS DURING 1909.

	Hrs.Min.
January	428.30
February	358.15
March	353.10
April	298.10
May	263.20
June	234.45
July	248.30
August	278.00
September	311.25
October	370.05
November	397.40
December	438.35
	3980.25
Deduct on account of 50 min. extinguishing time	30.25
Total, yr.	3950.00

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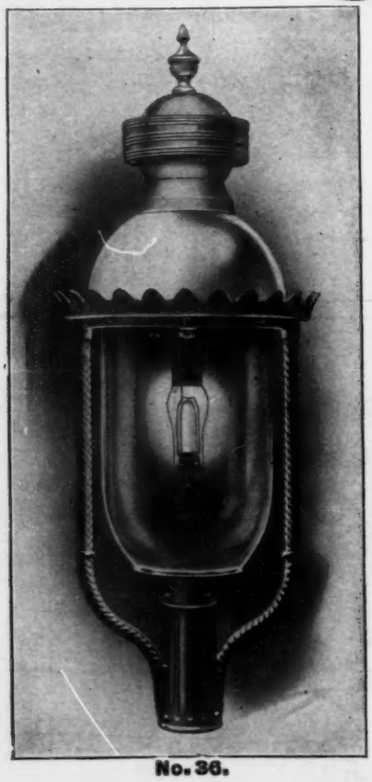

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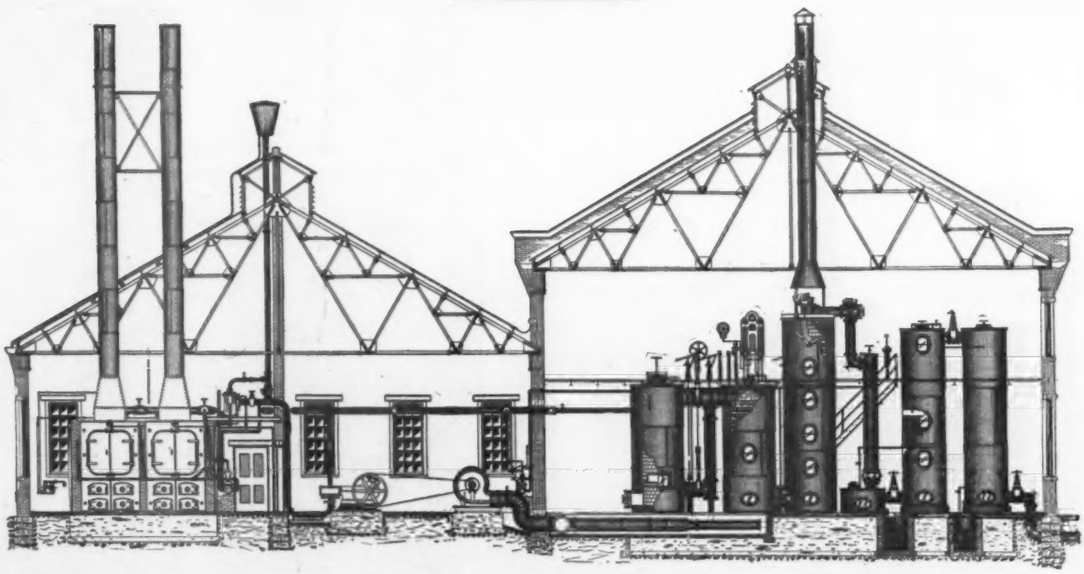

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TOTAL DAILY CAPACITY, TO DECEMBER 31, 1908, ... 558,565,000 cu. ft.

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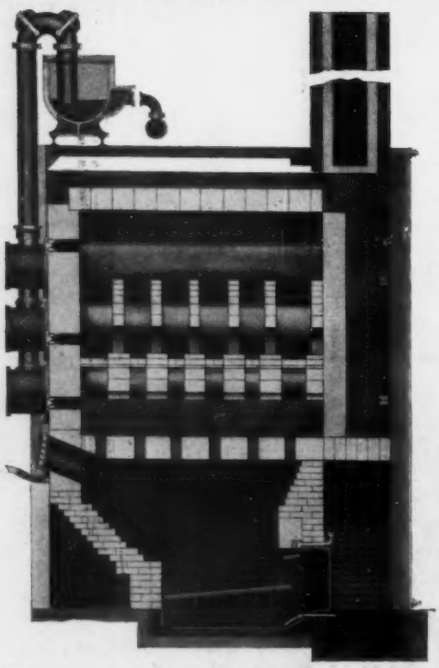

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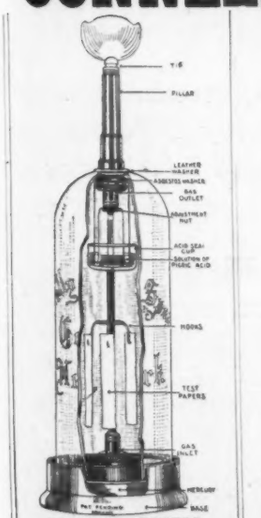

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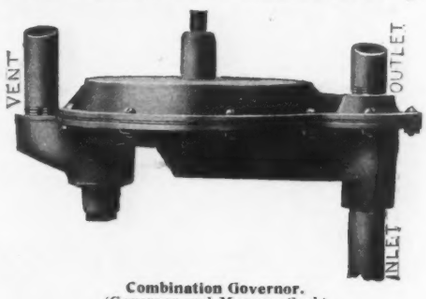

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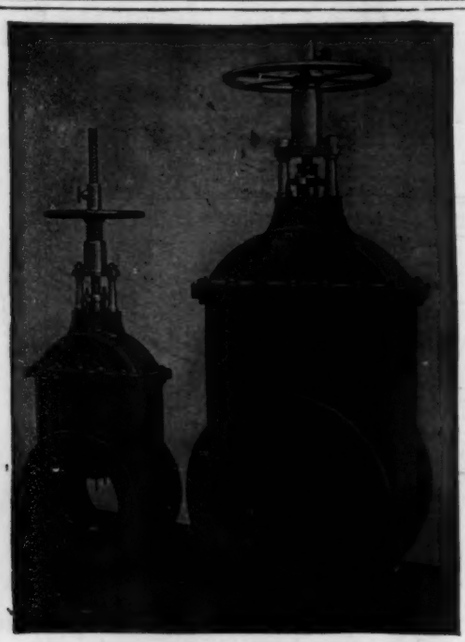

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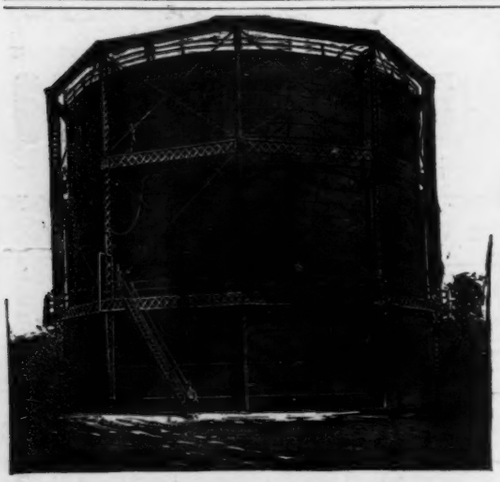

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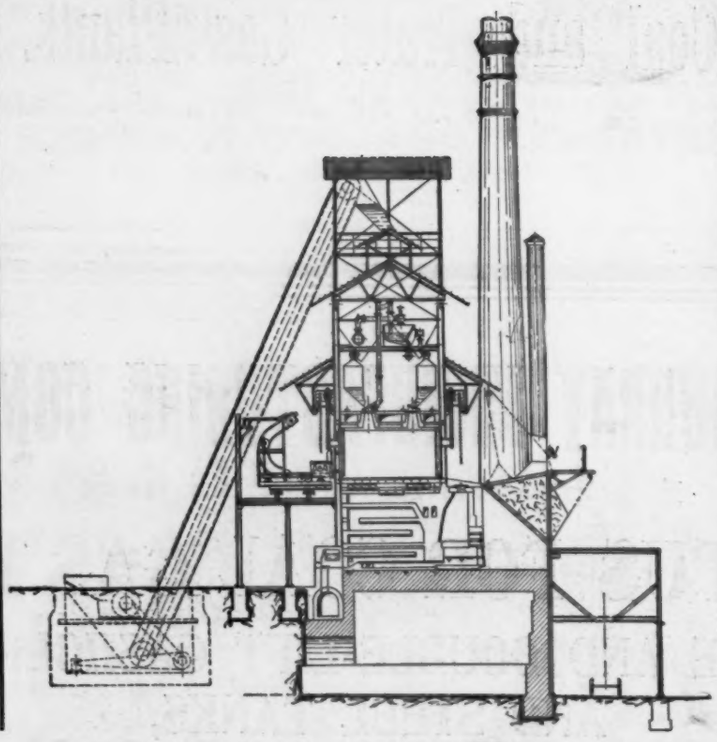

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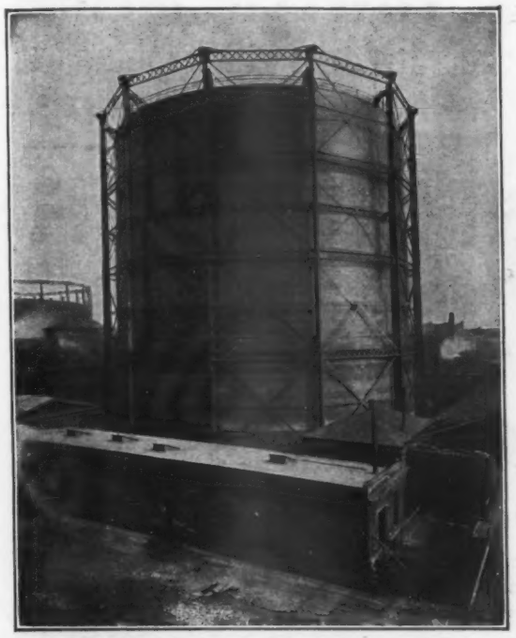

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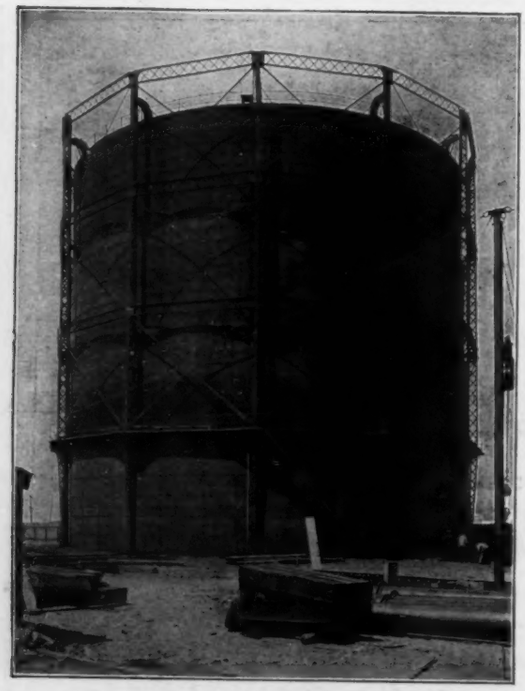

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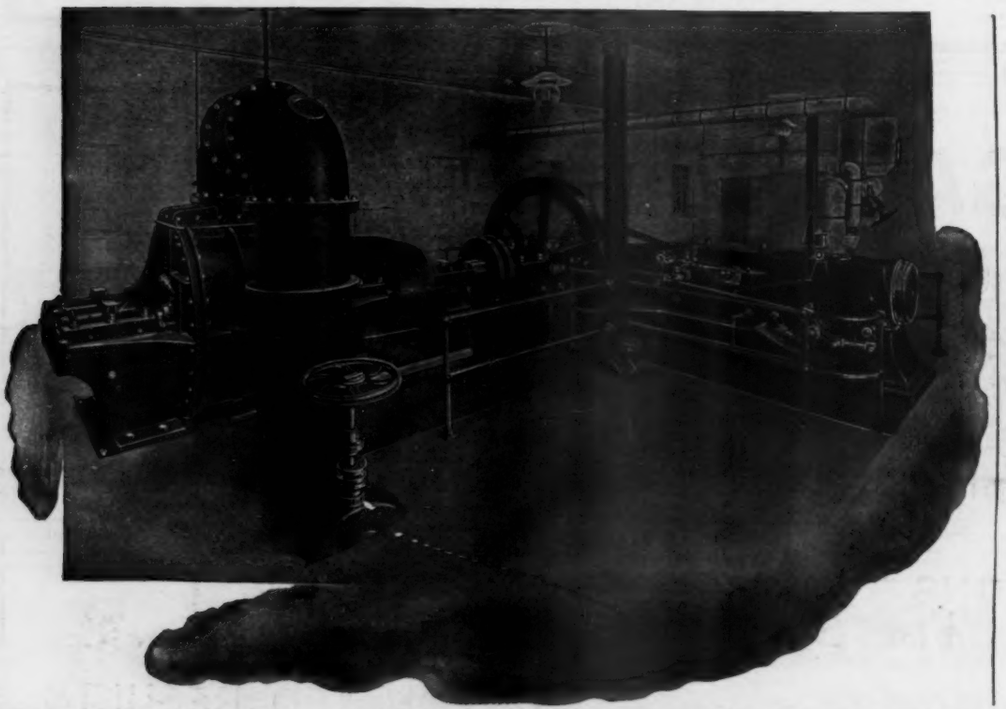

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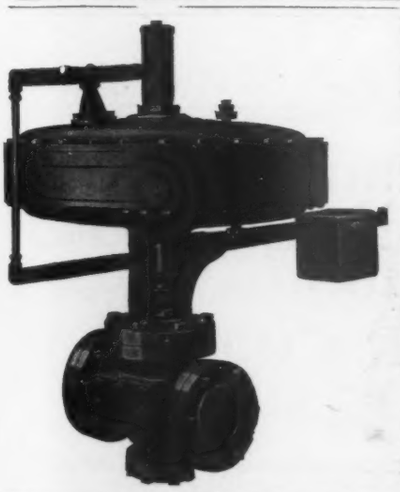

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